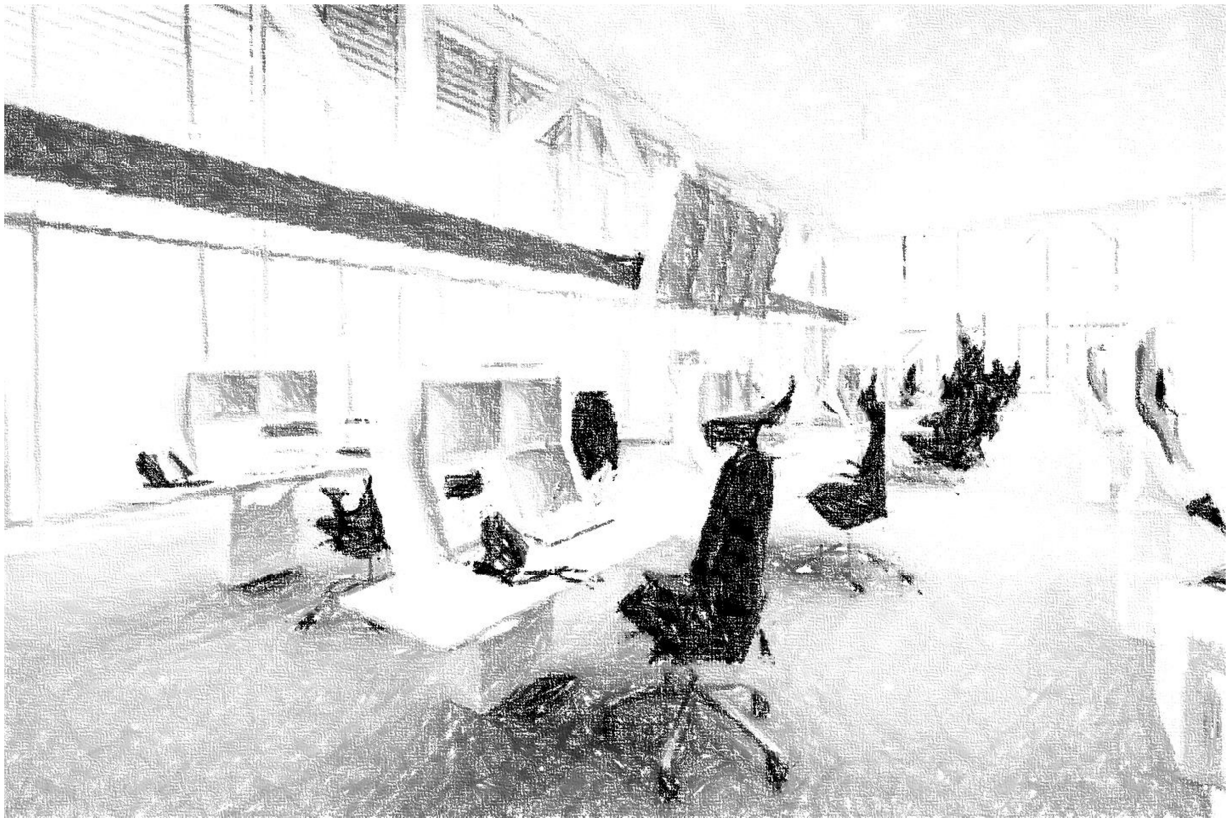

EFFECTIVE TASK ARRANGEMENT IN EMERGENCY DISPATCH CENTERS

An analysis of considerations to high performance of emergency dispatching

August 2015
MSc Thesis Sjoerd van Duijn

EFFECTIVE TASK ARRANGEMENT IN EMERGENCY DISPATCH CENTERS

Master thesis

Author:	Sjoerd van Duijn
Student number:	1289489
Contact information:	svduijn@gmail.com; +31(0)616776669
University:	Delft University of Technology (TU Delft), the Netherlands
Faculty	Faculty of Systems Engineering, Policy Analysis and Management (TPM)
Program:	MSc Systems Engineering, Policy Analysis and Management
Graduation section:	Information & Communication (I&C)
Organization:	Veiligheidsregio Rotterdam-Rijnmond (VRR)
Graduation Committee:	Prof.dr. Y.-H Tan (TPM, TU Delft)
	Prof. dr.ir. M.F.W.H.A. Janssen (TPM, TU Delft)
	Drs. H.G. van der Voort (TPM, TU Delft)
	J.A.M Hartman (Veiligheidsregio Rotterdam-Rijnmond)

This graduation thesis is written for the

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commissioned by

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FOREWORD

Since 2011 I am the director of the dispatch center within the Veiligheidsregio Rotterdam-Rijnmond (VRR). The VRR is the official cooperation of emergency services organizations in the region. This organization is set up to enable short communication lines, direct coordination and clear responsibilities to improve the care that is provided to the region's citizens.

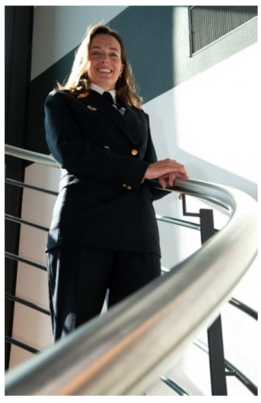
The VRR is the heart of the disaster and crisis management in the Rotterdam-Rijnmond region. The emergency dispatch center forms its epicenter where all of the communication is brought together. Here an oiled machine of hard working people and technology react to immediate emergency situations. With more than 1.2 million citizens the VRR is the largest safety region in the Netherlands. The diversity of the region has a big influence on the challenges we face to provide high quality services.

From the World Port Center in Rotterdam, safety is managed for one of the largest port cities in the world. Via the national emergency number 112 our emergency dispatch center handled over 185.000 emergency calls in 2014. This translates to over 15.200 fire truck pull outs and 112.000 ambulance rides. According to satisfaction research with a score of 7.9 on average our service is highly appreciated. We however continuously strive to increase this score even more by improving our organization.

The ongoing transition has a big impact on our organization. Among other things we have rethink and adapt our ICT services and work processes. A lot of time and effort is currently made to make the operational center future-ready.

From his interest in the ongoing changes Sjoerd has analyzed our situation and tried to contribute to our current efforts. His outside-in scientific perspective provides a new and insightful view on the issues we face. The findings of his research add value to us because it increases our understanding with respect to the difficult decisions we need to make, especially concerning the operational issues and also possibilities that lay ahead. We can use the insights Sjoerd provides in our management discussions about how to organize our operational activities, and also as input for our upcoming pilots.

I believe that research can aid us gain an even better understanding of how to organize our important activities. This enables us to achieve the overall goal of minimizing damage and suffering caused by emergency situations and to live up to our motto 'together strong'. By increasing our knowledge and providing a fresh view I think this thesis contributes to exactly that objective!



Drs. A.C. Trijselaar, mpa
Director Dispatch Center Rotterdam-Rijnmond

Rotterdam, August 10, 2015

PREFACE

On a sunny summer day only weeks before the end of this thesis research I was driving on the highway. Destination: Sneek. Some 200km north of the prettiest city in the Netherlands, which is 'coincidentally' also the city I was raised in and the city where I did my thesis research; Rotterdam. During this trip I was thinking about the fact that oftentimes you are busy striving towards a goal, a destination, without realizing the value of the moment you are in at that time. It is a great idea to realize that the destination is not the only goal. In writing this thesis it was easy to get lost thinking about the end goal of project completion without realizing the 'moments' that are important along the way. These moments of euphoria, frustration, or even despair quickly succeeding one another are as important as the destination itself to remember, and to learn from. I will always remember these moments as now the pinnacle of my Master studies is almost there, and I hope to remember not only the result but mostly the journey and all of its lessons.

Although the words in this thesis have been written by me on my laptop, I owe a lot of gratitude to the people who have supported and aided me in the process. Firstly I want to thank my graduation committee; Marijn Janssen for his enthusiasm in helping me, his readiness to make time and listen to me and the issues I had during the process, for his patience and next to the high quality substantive feedback, for giving me just the right pushes into the right direction to help get this report over the finish line, secondly Haiko van der Voort, for his sharp analysis of my progress reports, for helping me to take that step back once and a while to oversee what I was doing, reminding me to think like a researcher and from different angles, and for giving me very helpful advice at a crucial point in the thesis writing process. I also owe great thanks to Jan Hartman for helping me as supervisor from the VRR to get into contact with all relevant parties, for being available whenever I needed, providing me with the needed information, but most of all for giving me the feeling of standing beside me in the struggle of completing this thesis report. I also want to thank Yvonne Huizing and Bas Swets from the VRR for warmly letting me into their work environment, getting me acquainted with the organization at the World Port Center, and for their help and support during numerous meetings.

Besides my graduation committee some people deserve to be noted here as they have given me tremendous support throughout the process; first of all, my friends and roommates who know that I appreciate all their help and support. More specifically I want to thank Jeroen Herpers for being a study buddy and soundboard, pushing me to get up an hour earlier and staying an hour longer to study every day, Rick van Koppen for the countless hours of brainstorming over the phone and in person, and finally I want to thank my family, my brothers and especially my parents, for the infinite amount of support and commitment that I felt throughout my studies and graduation project, for their optimism and for giving me the room to invent and do things my own way. They are the biggest reason that I am now able to present to you the final product of my study time; my MSc Thesis.

Yours Sincerely,

Sjoerd van Duijn
Delft, August 2015

EXECUTIVE SUMMARY

Recent policy choices by the Dutch government for improving uniformity of emergency dispatch centers across the Netherlands, which include budget cuts have led to the idea of changing the current organization on and task structure of Emergency Dispatch Centers (EDC's) in the Netherlands. The initiatives driven by technological changes were initiated in 2012. These current structural revisions make this a good moment to investigate the current functioning and alternatives for the future.

Fragmentation is currently visible from the strategic to operational level where each dispatch center involves three co-located agencies of fire-, police-, and ambulance departments. Fragmentation of responsibilities and knowledge within and between emergency dispatch centers increases the complexity of transformation. An understanding of the systems complexity is needed to make well informed policy choices. With the intended transformation, concerns arise regarding the effects of policy choices on the operational level. It is unknown which different preferences exist towards operational task allocation. Operational perspective considerations to their design aren't known yet. Tensions between organizational layers could become present, but these are unknown, with the risks of becoming known too late in the process when more money is already spent, and the government is locked in to a solution.

Research Question

To get insight in the problem, the research question for this thesis study is:

> What are the most important considerations to the effective organization of an emergency dispatch center in order to achieve high quality emergency response considering different possible scenarios to its task arrangement?

Approach

The answer to the research question is derived by performing literature and empirical research, including an evaluation exercise. To be able to answer the research question an overview of the current system therefore first had to be modeled. BPMN modeling was used to investigate the tasks and processes at the emergency dispatch center. IST-SOLL analysis derived prominent considerations for task change and execution. From both theory and from practice several indicators for performance of the operational system are derived.

The research started with of literature review and three initial discussion group meetings with four experts at the Rotterdam-Rijnmond EDC. After this a thorough analysis was done of current and desired situation. Seven interviews with different experts from different domains within the EDC's of Rotterdam-Rijnmond and Zuid-Holland-Zuid were used to explore the problem situation and identify concerns.

To understand the performance of the system, an evaluation survey was set up. Alternative task arrangements were compared using multi-criteria analysis. For this 12 operators were asked to score three scenarios that were used to evaluate opinions about task arrangements. Furthermore 13 interviews were held accompanying the survey, to identify underlying reasons for the evaluation scores. A. Based on results from the evaluation, the best task division could be evaluated. Numerous expert and progress meetings with graduation committee at the TU Delft were used to report and iteratively improve on all aspects of the research.

As an important concern is what the effect of future task arrangements/scenarios is on the performance indicators, the results are also interpreted for this. The results gave insight in which considerations are most prominent when designing the task structures at the EDC.

The answer to the research question aids policy makers to assess the effect of decisions taken to change the operational task structure within the EDC. Furthermore the apparent considerations to effective task execution that weren't known and the impact of indicators on the quality of service aid the design and discussion about future task division can now be taken into account.

Conclusions

When it is looked at possible task arrangements, different task distributions can be chosen, depending on which are deemed the most important criteria and how their relations are seen. It has been found that these differ from different points of view. The political layer is dependent on operators for execution of tasks, while operators have to abide to a complex system of rules. There is a complex dependency between the political and operational layers which together have to provide the best possible service to civilians. The expertise of task execution lies within the operating core. Operational agencies at the EDC are however dependent on the political choices made. With the goal to deliver high quality emergency response, decision makers should take into account the operational view on handling emergency dispatching services.

Three possible task arrangement scenarios were found feasible, and were evaluated:

1. Specialist dispatching. This resembles the current situation where the responsibility for emergency dispatching is divided according to operator specialism and emergency call type.

2. Multidisciplinary intake. This displays the operational outcome of the politically desired transformation. Any type emergency call can be treated by the any operator. Backup specialists are available in case of extra knowledge need.

3. One-stop-shop intake. This resembles scenario 2, except no backup specialists are available and a true one-stop-shop is created.

The evaluation shows that trade-offs have to be considered to determine the best arrangement. There is no single best scenario. While the current task division is deemed best by operators, because of its overall quality delivery, in general the conclusion can be derived that there is no best task arrangement.

Certain arrangements aren't possible or plausible in general or require very difficult resource scarcity issues to be overcome. In general describing positive and negative effects of different task arrangements is possible based on the identified and evaluated criteria.

It has been concluded that quality of service is a trade-off in comparison with other criteria such as costs. Also it has been observed that operators give such high scores to 'quality of service' as a criterion that it actually becomes an overall goal, more than a criterion. This leads to that every criterion score that influences the quality negatively is judged badly. Thus quality can't be traded off in the eyes of operators.

There are three considerations that *have* to be incorporated when designing an effective task arrangement.

- Standardization versus professionalization
  The choice exists between the 'most uniform service delivery' and the "best individual judgment".

Specialism increases the judgment of specific emergency calls, but decreases the uniformity of service delivery and increases dependence on specialist knowledge. Protocoling increases uniformity but extra costs might occur due to the difficulty of correct classification of emergencies.

- Specialism versus generalism
  The initially desired situation (2) leads to more generalists and as a starting point, increases the knowledge needed. The complexity and thereby feasibility of performing the multidisciplinary intake should be examined to find to which extent the two alternative options are feasible.

- Information sharing for collaboration versus information divide for privacy
  Regulatory issues are expected when changing task arrangements The consideration is how to improve collaboration without breaking regulatory boundaries and overcoming the issue of losing too much quality by non-collaboration.

Recommendations

Decreasing the complexity of the situation by improving knowledge is a general concept that has benefits in the transition process. If it is known beforehand which problems arise on an operational level, then this can save money (not turning back measures), Improve decision making consent (operators may agree more) and increase the quality of service (performance) from the new system.

Creating commitment increases the chance of success. It is recommended therefore, as the process is already going on, to include operators in the EDC into the process. A proven concept of testing, which is relatively inexpensive can bring to light how to deal with the considerations, is piloting which should be carried out as follows;

Before the pilot a consensus about consideration importance should be reached or at least differences discussed. Operators should be educated that not only quality of service is important from a holistic point of view. A pilot can be used to measure the performance. To do this a pilot setup needs to be made with different configurations based on the trade-offs that are found.

It is relevant to do further research into the differences between the managerial and operational layers. Current research could be validated and further quantified at other EDC's in different geographical locations. Other sectors with a similar organizational structure and transformation issues can use this research as reference point. An example is the centralization of power by combining provinces into super-provinces.

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1 INTRODUCTION

New technologies and accompanying ways of working provide big opportunities for governmental organizations to improve their services to civilians. In order to adapt to the changing technologies these organizations need to adapt as well. At certain points in time there becomes a need for revolutionary change. Responding to emergencies, which is a governmental responsibility, can be improved by incorporating new technologies and ways of working. Governmental organizations are however historically (compared to private organizations) characterized by rigidity, inflexibility, regularity and a lack of innovativeness (Rainey, Backoff, & Levine, 1976). In case of change these characteristics can have a negative effect on the ability to change of governmental organizations. Currently the 'Project Organization Merger Emergency Dispatch centers of Rotterdam-Rijnmond and Zuid-Holland Zuid', that represents the regional police organization and the safety regions of Rotterdam-Rijnmond and Zuid-Holland-Zuid, is faced with the challenge to redesign operational tasks at the Emergency Dispatch Center (EDC). The source of this need is the governmental wish to reform the sector. This should improve the efficiency and quality of service delivered and decrease costs. However this is not a straightforward change as different partial-project leaders at the Rotterdam-Rijnmond (RR) EDC brought to light:

*The EDC struggles with the information division, how to define current and future (operational) processes and how would these processes look ideally? The structural change is complicated because of the need for collaboration between the agencies involved (*discussion meeting with experts, appendix A.10).

What is clear is that the executing bodies and decision making bodies have a different view on the issues at hand. The issues need to be overcome to ensure that the whole system can perform at a high quality level. The complexities involved will be investigated to increase the understanding of how to decide on arranging tasks in the EDC. By doing this the new technological possibilities can be exploited. Else societal costs may be higher than the benefits of the innovation.

Chapter structure

In this chapter the thesis research problem is explained. The first section consists of an introduction to emergency response complexity. Then the problem explanation and research approach are described. First of all the problem description and knowledge gap are discussed. Then the main research questions that will be answered by this research id described. In paragraph 1.4 the relevance of the research is explained and in paragraph 1.5 the scope is presented. Finally in section 1.6 the research design including methodology is explained.

1.1 EMERGENCY RESPONSE MANAGEMENT

Safety, security and health are three of the most basic needs of humans, as depicted by Maslow's pyramid (Poston, 2009). High quality healthcare, law enforcement, crime prevention and crisis management can improve public safety. A key task of the government is to ensure this public safety. Higher safety can beachieved by high quality response to crime and health & safety related issues. An emergency can be defined as any situation caused by nature or man, (possibly) harming people or property (Shen & Shaw, 2004). Achieving high quality emergency response is a challenging and complex task because of - but not limited to - the variety and consequences of emergencies, responsible agencies, resource scarcity and the need to react within a short time frame. Coordination and collaboration among emergency response services is thus needed to minimize the negative effects of an emergency (W. Chen & Decker, 2005).

Within a Dutch Emergency Dispatch Center the co-located police- fire- and ambulance care department have to work together to provide for emergency dispatching services. The integration of these services is not perfect. The arrangement of responsibilities is a result of historic growth and fine tuning, which can be partly described by the 'sunk cost' of innovation through historic context.

The police-, fire- and ambulance operators have to work according to laws and regulations and when this environment is stable this leads to a stable situation (of which it is not certain if this is the optimal situation). The complexity of the work at the EDC can cause problems especially when institutional and technical changes to the sector are initiated. These changes initiated by politics can have an effect on daily operational tasks. When the EDC operators are faced with imposed budget cuts and operational changes the question raises how to ensure that the service will still be sufficient, or maybe even improved. In summary; how to optimally arrange the tasks within the emergency dispatch center in lights of the complexities involving technical and institutional developments?

Disasters and emergencies require tight coordination, from the national to regional level (e.g. fire dept. management) and of emergency response units on the road. Coordination within and between emergency services also concerns important information flows. Technology enabled information sharing has improved government capabilities for emergency response in the last decades. Information can be seen as a basic need to be able to govern and guide decisions and processes. Accurate information, accurate information sharing and well-defined coordination of roles and tasks are needed for accurate decision making. A lot of information and coordination flows are present within and between organizations in the EDC Only if the tasks, their necessities and the intra- and inter organizational collaboration schemes are well understood, it is possible to estimate their effectiveness and make well informed decisions about how to arrange and manage them (Pardo, Cresswell, Dawes, & Burke, 2004). In this light this research tries to contribute towards insight into the way cooperation, coordination and the roles within an incredibly important governmental organization are to be set-up.

1.1.1 DUTCH CHARACTERISTICS

Emergency response in the Netherlands is a governmental responsibility which is coordinated on different national, regional and local scales. The Emergency Dispatch Centre (EDC) serves as integral hub for emergency dispatching. In this center the fire department (fire dept.), police department and ambulance care department are located and working together to ensure high quality and fast response to emergency calls for their particular area. The dispatch center is the heart of the operation of the emergency services in the provision of assistance, incident prevention and crisis management. Coordination between the different agencies involved entails accounting for differences in technology, applications, processes and information (Bharosa, Lee, & Janssen, 2009; Diehl, Neuvel, Zlatanova, & Scholten, 2000). This means that there are a lot of things to take into account. Currently twenty-five emergency dispatch centers in the Netherlands operate in their respective regions. The safety regions can be seen as cooperating but also partly autonomous organizations within the Netherlands operating with different levels of autonomy and uniformity among and inside these organizational bodies. One can imagine that where regions overlap cooperation is higher than between regions in the North and South of the country.

Political choices have led to a governmental decision on reforming the organization of the emergency sector. The need for improving uniformity of emergency dispatching, as well as choices for budget cuts and redistribution have led to the idea of changing the current institutional situation and organization of EDC's in the Netherlands.

Due to the policy changes a lot of adaptations in the EDC environment are being planned and implemented. On of thet changes in regulations is a structural budget cut of fifty million euro's for the whole sector by 2018 (Ministry of Safety and Justice, 2013). Furthermore a national emergency dispatch organization is being set up (LMO) as well as a new national emergency dispatch system (NMS). These changes will affect operations as well as there are planned changes to the process of emergency call dispatching (De Vries, Bayens, & Hoek, 2013). With emergency dispatching it is meant the whole process of handling emergency calls within the emergency dispatch center.

FIGURE 1 ROTTERDAM RIJNMOND AND ZUID-HOLLAND ZUID SAFETY REGIONS

Within an EDC emergency calls from civilians are processed. This is generally called dispatching. The processes within the twenty-five different EDC's in the Netherlands are mainly similar and consist of call intake, processing and output as will be explained in chapter 4. This report focuses on the intake process as it is a vital process within the EDC as well as it being subject to major changes. This will be explained upon later. The EDC can be seen as a service provider for emergency management services to its customers. These customers are the police dept., fire dept. and the ambulance care organization within the safety region. Both normal (typically called; cold) emergency processes as well as disasters (warm) are managed through the EDC's. In cold situation there are different organizational structures compared to warm incidents. Both situations have different organizational protocols and consider different processes and management. This report focuses on the 'cold' emergency processes in light of the ongoing developments.

1.2 RESEARCH PROBLEM DEFINITION

In this section the research problem is defined. The problem owner for this research is the project organization responsible for dealing with the intended organizational changes that are going on. Due to the mentioned policy changes, the EDC of the safety regions Rotterdam-Rijnmond (RR) and Zuid-Holland Zuid (ZHZ), displayed in figure 1, are facing significant changes. The "project organization merger of emergency dispatch centers of Rotterdam-Rijnmond and Zuid-Holland Zuid" is responsible for developing and executing plans on how to deal with the changes in the environment of the EDC in both regions. The complexities involved in this have led to this thesis project.

One of the important intended operational changes is that of introducing the multidisciplinary-intake process, more popularly called multi-intake. Among other changes this change towards a one-stop-shop principle, popular in e-government innovations, may lead to problems in required knowledge and cooperation (Sader, 2000). It is at the moment unclear how in the current and future network of agencies related to the new combined EDC of RR and ZHZ will have to work together. Plans have been made but these plans have to be translated to concrete actions and the plans involve changes that will have effects that will be visible throughout the complete domain of emergency response (Ministry of Safety and Justice, 2013). In this context a lot of unknowns exist on how to translate the decisions that are made on a strategic level towards the tactical and operational level and from existing situation towards the future situation.

There are different ways to manage tasks in order to achieve a common goal. This management is described as the governance of the organizations, tasks, and processes (Kooper, Maes, & Lindgreen, 2011). From the notion that governance needs high quality information, knowledge of the information flows and roles between organizations and employees within the EDC and also its large amount of partnering agencies is thus very important. As there are many ways to manage tasks, there are many possibilities to coordinate and assign responsibilities and tasks. In the Rotterdam-Rijnmond EDC currently there is a task arrangement aimed at effectively handling

emergency calls at a 24/7 basis. If this is the most effective way to organize the system is however unclear.

The government has decided for institutional changes in the organization of safety regions to improve the uniformity of safety response, decrease overall costs (appendix A.8), improve efficiency and eventually improve the overall quality of emergency response. In addition to forming a national police force, the government has decided to bring back the current amount of twenty five to ten EDC's. These ten control rooms are to be housed under the responsibility of the "National Emergency Room Organization" (Dutch: Landelijke Meldkamer Organisatie, LMO), which is to be set up (Ministry of Safety and Justice, 2013). The main structure is shown in appendix A.4. This means that responsibility shifts from local to national. The statutory duties of safety regions to set up and manage a joint dispatch center of police, fire dept. and ambulance care dept. will thereby be taken over by the LMO. Before this is accomplished, there is a "transition phase".

How to deal with the control (governance) of the EDC's, finances, (if any), the transfer of personnel, restructuring of tasks etcetera is a.o. arranged under the "Transition Agreement" (Ministry of Safety and Justice, 2013). This national transition agreement is concluded between the Ministers of V & J, Health, Defense, the management of the Security Council, the management of the Regional Ambulance Provisioners (RAV's) and the chief of the National Police. This agreement was concluded on 16 October 2013. It is an agreement in principle; this means that further elaboration will be needed to fill it in. It is mainly a strategic document imposing the desired future state, yet without detailing on the process or precisely identifying steps to be taken by the EDC's. The common goal that is formulated regarding the LMO is "to achieve an effective, high quality and efficient organization with ten EDC locations". Figure 28, appendix A.4 shows the organizational structure of the LMO that is being set-up. This means still a lot is undecided, or not thoroughly investigated. This includes the question of how the intended transitions will have an effect on tasks in the EDC. An example of work in progress is the reference architecture. This architecture is being designed by and for the safety regions. Standardization and privacy aren't investigated here yet.

1.2.1 KNOWLEDGE GAPS

As discussed a strongly changing environment exists in which the 'project organization merger emergency dispatch centers' has to deal with a lot of unknowns and incomplete information. It is clear in broad terms which tasks are to be executed by the combined EDC in the new situation, however it is unclear how task execution and processes among the agencies related to the combined EDC are exactly organized and to be organized and which effects different arrangements have on the effectiveness of the system as a whole. This lack of knowledge is therefore the central problem that this thesis research will focus on. Specifically the project organization is interested in how to cope with the intended changes on operational level within the Rotterdam Rijnmond EDC as the strategic decision made have unknown effects on this level. The most important knowledge gaps that accompany this question are described next.

It is unknown in general how to shape new roles, if and how to change the task arrangements of different agencies involved and also which trade-offs thereby exist. It is important to note that differences are expected between the decision making layer (politics/government) and executing layer (operational agencies at EDC). These differences of views on how to arrange tasks can lead to considerations and trade-offs to be taken into account in order to achieve an effective emergency response system. For this to be investigated, the current processes have to be examined. A lot of unknowns also exist regarding the technical and institutional systems that are affected by the regulatory and statutory change. In preliminary investigation it became apparent that the first knowledge gap is thus to examine the current and desired environment of the EDC. "…to reach the intended goals insight in current processes, and particularly which (operational) processes are necessary to do it efficiently is needed. (interview: Bakker, 2014)" The most prominent question is how the transitions in turn have an effect on the operations at the EDC. It is also unknown if there is consensus about the transition, the goals and how in the end tasks should be arranged. From intake to issuing operational changes have to be made in the entire emergency call handling process. These changes are currently occupying the project organization.

In sum, the research problem can be stated as below:

It is unclear according to which considerations the organization of an emergency dispatch center is and should be arranged in order to deliver better emergency dispatching services to civilians.

There is a lack of insight in the considerations to take into account when re-organizing the EDC. This research unravels the complexity that is linked to the innovation of the emergency dispatch center organization in the Netherlands.

1.3 RESEARCH GOAL AND RESEARCH QUESTIONS

The goal of the work in this thesis is to determine the effects of alternative coordination arrangements for future EDC tasks execution. A mapping of which considerations and trade-offs should be addressed will aid them to make better informed decisions on task (re)structuring. The main research question is as follows:

> What are the most important considerations to the effective organization of an emergency dispatch center in order to achieve high quality emergency response considering different possible scenarios to its task arrangement?

The main question is subdivided into five sub questions:

1. Which theoretical contributions aid to the understanding of effectiveness and (re)structuring of public organizations, and how can this be used to analyze operations at the EDC?
2. How can the current situation at the Rotterdam-Rijnmond EDC be defined in terms of organizational structure and operational processes and how are these linked to subsequent possible issues?
3. Which considerations/criteria to designing a (new) way to arrange operational tasks at the RR EDC are important to evaluate and how ?How are these considerations evaluated?
4. Which task arrangement is preferred?

In order to achieve this, a thorough analysis of the existing environment (IST) including organizational structures, actors and processes will be done and an analysis of the desired future (SOLL) situation is done to design scenarios. An advice will be given concerning task arrangement at the EDC in light of the current changes.

1.4 SOCIETAL AND SCIENTIFIC RELEVANCE

From the premise that high quality emergency response can only be achieved when coordination and collaboration between relevant parties are well aligned, it is important to improve insight in this and investigate possibilities to improve its effectiveness in light of proposed organizational changes. Coordination is defined as the formal division and the management of responsibilities. Collaboration is defined as the way operational experts work together within the EDC. With knowledge about his the EDC's are able to make better informed decisions. This leads to a higher quality of services.

The importance of an EDC in society cannot be overstated. As one of the primary goals of government is to ensure public health and safety for its civilians, emergency response and safety control are among its upmost important tasks. Hence, knowledge of the effects of changes in the institutions responsible for these tasks on eventual quality of the execution of these tasks is

important. Scientifically an insight in the institutional context of this public emergency agency is interesting in terms of how performance of such a multi-agency collaborative governmental institute can be measured, improved and which way roles are to be divided and managed.

Horan et al. (2006) argues that emergency response is time-dependent (R. Chen, Sharman, Rao, & Upadhyaya, 2007, p. 200). Good coordination is critical when faced with incomplete knowledge of the situation (R. Chen et al., 2007). As of the current situation, not all facets of the problem are known. Because of the complexity of the Emergency Dispatch 'system' these challenges aren't easily overcome, Veeneman (2004) explains; 'complexity is limited understanding of the system.' This leads to suboptimal results and it is one of the reasons why more insight in the current and evolving system is needed.

The aforementioned complexity is one of the main reasons of importance for this research. The system is complex for that it consists of multiple actors with a high level of differentiation and interdependencies. From the book of Meijer, Boersma, & Wagenaar, (2009) about the development of "C2000", a Dutch communication system for police, fire brigade and ambulance, the importance of an integrated design can be found. Implementation of the communication system in that case was delayed for 6 years, resulting in a 13 year project. This was first of all due to the required complex new technology. But the technology alone didn't cause most problems. Institutional changes where needed to use the new system, thus implementation was delayed due to a lot of organizational dynamics that actors at local, regional and national level had difficulty dealing with (Meijer et al., 2009). Furthermore the willingness of actors as well as their competences to deal with the changing system are important to take into account.

1.5 SCOPE

The research will investigate the elements that need to be taken into account in the changing organizational environment. The Rotterdam-Rijnmond Emergency Dispatch Center is used as the primary case to study the elements that play a role, and to investigate how arrangements can be made. The Rotterdam-Rijnmond EDC is chosen as it is currently one of the EDC's that is a front-runner in the investigation and application of ongoing organizational changes, and as such the insights of this thesis study are useful to them.

The project will be carried out as graduation project for the Delft University of Technology. The deliverable will aid the project organization "merger control rooms Rotterdam-Rijnmond and Zuid-Holland-Zuid" on making decisions for coordination of tasks on operational level as well as provide deeper insights to dealing with the organizational changes at hand. In detail, the operations within the EDC will be examined in order to find the most important issues regarding effective and qualitative emergency call handling. Concerning the operational level agencies and operators are looked at that have an (in) direct involvement in cold operational emergency call handling processes within the EDC.

The research is limited to investigating the call intake process in light of current transitions. By doing this, other processes aren't taken into detailed account. Furthermore only 'routine' emergency calls are investigated, which limits the amount of agencies that are considered. The perspective is taken of the operational side of the Emergency Dispatch Center, with a study on the EDC of Rotterdam-Rijnmond. Information is also limitedly gathered from the EDC in South-Holland-South.

1.6 RESEARCH DESIGN

In this section the research approach is explicated. First the theoretical context is depicted to describe from which background, or through which lens the research is looked at. Then the approach to answering the research questions is described. Furthermore the research methods used in this study as well as the thesis outline are depicted.

1.6.1 THEORETICAL CONTEXT

In this study the organizational changes are put in the context of professional bureaucracies and their structuring and characteristics. A professional bureaucracy is a form of organization in which the agencies operational forces work as professional entities within the organization, while the governance and decision making power lays with the higher government, or management.

Organizational theory will be used as perspective for finding considerations for the transformation that the government is trying to accomplish. Operators have a pull to professionalize their environment to be able to manage it, whereas managers try to gain control by centralization. The behavior and vision that might be expected from these groups is different and thus tensions are expected. These notions are investigated in chapter 2. The goal for designing task arrangements is to minimize the difference in views, or gain consensus about the considerations that are most important. Organizational theory is used as a lens to examine the subject matter.

1.6.2 RESEARCH APPROACH

The research sub questions to be answered are used also to structure the research. This section gives a short overview of the trace along which the research is structured.

Step 1 The first step corresponds to the first research question and the second report chapter.. It is the goal to understand the background behind organizational structures and change and specifically the tensions between and within different organizational layers. This helps understanding the views on organizational change and can explain why issues arise in organizational transitions. Also different types of issues in emergency response management found in previous research provide a starting point for empirical analysis. Except for institutional components of organizations also technical and process components are found, which aren't contained in organizational theory.

Step 2 The second step is to describe the current situation at the emergency dispatch center. In chapter 3 the environment in which emergency call handling processes are carried out is analyzed to gain an understanding of the requirements to the system, its components and processes. With an approach form general to specific the current environment is analyzed and a first insight into possible considerations to designing to task arrangements is found.

Step 3 A detailed description of operational processes and task arrangements in the IST and SOLL state are described in chapter 4. From managerial and operational sides considerations are identified. To see which are the problems that arise when designing task arrangements is detailed in this step. From this step it becomes apparent that more operational knowledge is required about current and desired task structures in order to come up with evaluation criteria. Evaluation criteria are designed, based on the considerations that are identified. Also scenarios to evaluate the criteria are derived.

Step 4 The evaluation of criteria is the next step, which is performed at the Rotterdam-Rijnmond EDC and in which operator expresses their options about options for task allocation. Chapter 5 explains the evaluation survey setup, scenarios and evaluation method in detail.

Step 5 This step, which concerns chapter 6 and chapter 7 aims to explain and interprete the evaluation survey results.. The quantitative and qualitative results on the criteria scores are interpreted. Its setup is explained in section 1.6.3. Based on the results it is possible to answer the main research question

Step 6 The final step is to conclude upon the main research question by evaluating the analyses done in the study. It is possible from the study to conclude upon the considerations to reach a suitable task arrangement. This is done in chapter 8, which also contains recommendations. Chapter 9 involves the reflection of the research is done to give insights in the limitations and pointers for future research.

1.6.3 RESEARCH METHODS

The data for this thesis study is collected through literature research and through empirical study at the Rotterdam-Rijnmond EDC. The second part is done by initial semi-structured interviews and later evaluation interviews are used.

DATA GATHERED

To start of this section, the amount and types of data gathered during the research is presented to give an idea of the time that was put in and the variety and depth of the research that is done.

- 6 hours of recorded interviews were gathered during the course of the research.
- 3 group discussion meetings with a group of 4 experts from the Safety region Rotterdam-Rijnmond helped define the research problem and question and the goal of the thesis study.

- 7 semi-structured interviews within both the Rotterdam-Rijnmond and Zuid-Holland-Zuid EDC were done. The experts interviewed were from different roles and backgrounds from police-, fire- and ambulance- departments. The goal was to gain in-depth knowledge of the problem situation. It improved the empirical knowledge of the problem domain and the prominent issues there the EDC faces. Moreover it gave guidance to thinking about possible solutions.
- 13 qualitative evaluation interviews were performed at the RR EDC with operational experts from 3 different operational roles (intakers, police-, fire- and ambulance-centralists) and supervisors.
- 12 quantitative surveys were done and were evaluated to evaluate the considerations for task arrangements (figure 2 shows an impression of the RR EDC).
- 250 papers, excerpts, reports and meeting documents are gathered in a personal repository. Keywords for articles that were read and used are a.o.: organizational and emergency (response) management theory, (information) governance, business process management, institutional analysis and design, process qualitative impact analysis, interoperability, inter- and intra-agency collaboration...
- 268 files were created that contain text, images and report versions during a countless amount of hours spent behind a laptop at the TU Delft.
- During the whole process in multiple expert meetings of one hour at the TU Delft with the graduation committee aided the conceptualization, scientific exploration and validation and improvement of the research.
- Multiple progress lunch meetings with a project supervisor at the RR EDC were used to inform and to discuss progress.

Literature review

To gain an understanding of the context of the research field a literature review has been performed. To understand organizational change within professional bureaucracies the widely appreciated organizational structuring and design research by Henry Mintzberg (1983) is used. To obtain detailed data on the organization at hand reports were gathered from the internet and at the Rotterdam-Rijnmond EDC, by asking employees for specific types of information.

Empirical study

TO give insight in the considerations that are concerned with (re)arranging operations at the EDC a case study is done at the Rotterdam-Rijnmond EDC. To evaluate different possible arrangements three scenarios were derived by examining the current and desired situation and interviewing experts. This led to the design of three feasible scenarios that were used to evaluate which criteria are most important when choosing how to arrange responsibilities. Also they were used to give an advice on the preferred task arrangement from an operational perspective. To be able to get insight in the particulars of the situation, discover the most important criteria, and to design scenarios a thorough problem analysis has been done. This gives insight in the important problems and considerations that the EDC deals with in this transition.

The empirical study consists of three parts or phases.

1. The first part follows the instruction of Verschuren, Doorewaard and Mellion (2010) to use preliminary interviews to establish a research perspective. To do this there were three group discussion interviews with a group of 4 experts from the safety region RR. During the meetings the research problem, process and scope (the how, what and when of the research) were discussed and improved (appendix A.10). In between the meetings the information was summarized and the research scope, problem definition and research process were developed which were used in the discussions.
2. The problem analysis phase used expert interviews, observations and one shadowing session at the operational hart of the RR EDC. The interviews were of a semi-structured nature in order to gather input data and develop scenarios and criteria to assess these. The criteria are developed based on the empirical analysis.
3. For the third part a multi-method approach is used (Miles, Huberman, & Saldaña, 2014). This approach can be used to score scenarios and describe underlying reasons. Quantitative surveys and qualitative accompanying interviews from all operational roles at the EDC where done to gain insight in which task arrangement is preferred. Upon this information a thorough advice can be given to the project organization on how to deal with the issues lying before them. This does not only aid the EDC of RR but also other Dutch EDC's in restructuring operational tasks.

Interview setup

As explained the empirical research consists of three parts; preliminary interviews, problem analysis aiding interviews and evaluation interviews respectively. The interviews in the first part were semi-structured and guided by progress documents that were made before and in between meetings and read by the attendees beforehand. In the early research stages the three group meetings with 4 employees were organized to establish the exact research problem. The meetings were attended by managers and staff involved in the transition of the EDC. Each meeting was preceded by a document in which the preliminary research setup and proceedings with respect to previous meetings were discussed. The agenda of the meetings consisted of establishing the research question, the scope, perspective and which information was needed and how to obtain this. Each discussion defined the research question and scope further. The first discussions led towards another research topic than the eventual topic. They first led to the goal of researching information flows within the EDC, and thereafter towards researching the network of partners of the EDC. Iterations in the research process led to task arrangement changes becoming the central research topic.

After the first problem exploration an analysis of current and future situations were conducted in the second phase of problem analysis. To validate the current situation and find considerations and criteria six experts were therefore interviewed. The subject of these interviews concerned first of all current and future emergency call dispatching processes. Verification and validation of how processes currently and in the intended situation are set up was questioned. Furthermore considerations, possibilities and perceived issues with different responsibility arrangements were

questioned. This first of all led to validation of business process models made of the current and desired situations. It also led to considerations that might be important for the division of tasks and from these interviews feasible scenarios were derived. The interviews were one on one with three staff members related to the project organization, two operations supervisors of police, and a disaster management employee. Also a short general questioning round with a few operators was done during a shadowing session which was held during one morning within the EDC of RR. This helped to get a feeling of the operational work at the EDC (Appendix A.10)

FIGURE 2 IMPRESSION OF THE FIELD RESEARCH AT THE ROTTERDAM-RIJNMOND EDC

To evaluate the scenarios that were set-up 12 surveys were filled in by 3 operational roles and the supervisor role (see appendix A.11 for survey format). These operators were also questioned about their preferences. This was done at the RR EDC (figure 2). The thirteen interviews yielded qualitative information about the opinions of operators. Detailed descriptions of the evaluation interview setup and execution are found in chapter 5 and chapter 6.

Exploratory research

The research approach is of exploratory nature. A large amount of unknowns and uncertainties exist about the research subject. A lack of a precise definition of current and future states of the EDC and the relationships amongst actors, tasks and processes makes exploratory research a useful type of research. Typical for this type of research which the researcher has also experienced, is the iterative scoping throughout the research to come to a clear depiction of the elements of importance. This is needed in this case because these elements are not well defined nor particular expertise is present. The case of the RR EDC has the function of an instrumental case study (Stake, 2013). For functional reasons this single case study was used to get a concise view of how EDC organization divides tasks and responsibilities. To do an in-depth analysis doing a multiple case study is less obvious for this thesis research as time and resources (experts) are dispersed over a lot of organizations that are geographically divided. Furthermore the RR EDC is representative of other EDC's as the same tasks, goals and major processes exist. This makes observations and conclusions generalizable. As the first need was to identify the most prominent problems, this is typically suitable the exploratory research method.

1.6.4 RESEARCH OUTLINE

To describe the outline of the research in general terms the starting point is the basic process archetype of Koberg and Bagnall (1972), obtained from Dubberly (2004) as shown in figure 3. Starting with an input, the research process can be broken down into two generic parts, namely "analysis" and "synthesis". After analyzing the different parts of the problem gaps are found for improvement. Then these are synthesized and discovered improvements can be designed. This leads to certain recommendations (output). This basic design process archetype serves as basis for the research outline (figure 4). The main input is the research question. This leads to the needed analyses (i.e. processes, information management and policies). The analyses lead to more insight in the system and possible improvements (considerations). This synthesis (current setting, considerations) consequently forms the basis for a (re)design and recommendations (output).

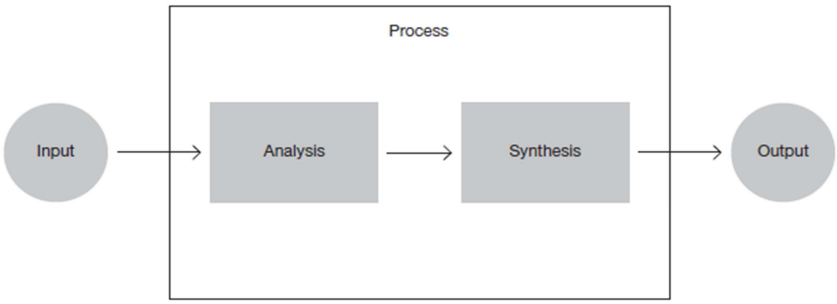


FIGURE 3 DESIGN PROCESS ARCHETYPE

To investigate the research subject the outline is shown in figure 4 including chapter numbers. Analyses are done on the organizational and operational level to define the current and 'to be' scenarios. This leads to propositions that will be evaluated in surveys. After this evaluation a reflection on the propositions is done to derive conclusions upon the research. Further discussions upon limitations and usage of research results will be given next, finalizing this research project.

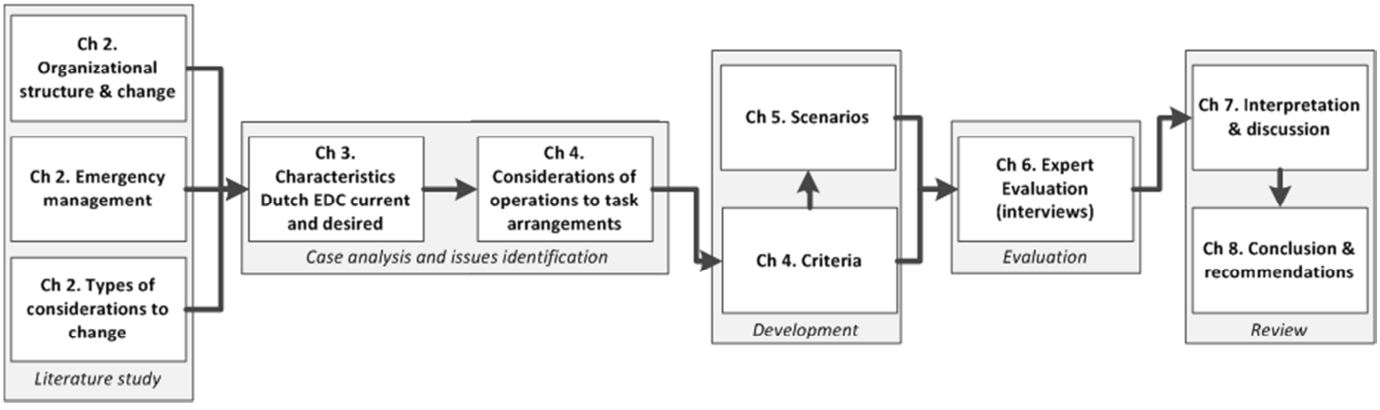


FIGURE 4 STRUCTURE OF RESEARCH (CHAPTERS)

1.7 CONCLUDING REMARKS

This chapter has introduced the research. The background of emergency response management under the current changing environment has been introduced. The main research question, to investigate considerations to designing the organization of an emergency dispatch center has been explained and the scope of the research and the methods are described. In the next chapters the analyses and results of the research are described.

2 THEORETICAL BACKGROUND

In this section the theoretical background used for this research is described. The research focuses on the changing emergency response environment in the Netherlands and the effect on the operational task arrangements. Resulting dynamics in the multi-actor setting will become clear. In this section the theory that is useful to understand the characteristics and expected behavior within these organizations will be discussed. This is done to place the organization of emergency response into context and identify from literature which possible problems can be encountered for the problem situation. This chapter answers the following research question:

> Which theoretical contributions aid to the understanding of effectiveness and (re)structuring of public organizations, and how can this be used to analyze and evaluate operations at the EDC?

The theoretical background is centered on the characteristics of public organizations and the understanding of their complexities in terms of structure, rigidness and change capabilities. Furthermore the literature is used to recognize the components that can help designing solutions to the research question. As explained in chapter 1 governmental organizations are historically characterized by inflexibility and a lack of innovativeness (Rainey et al., 1976). In case of change these characteristics can have a negative effect. The literature that is chosen aids to understand the characteristics of this change and more specifically the literature explains which issues arise from this change. The investigation will go into the operational emergency response processes that need to change because of political decisions. It is expected that dynamics exist between the operational and managerial layer exist. These dynamics are expected to be originating from the organizational structure that is in place and thus this chapter focuses on organizational theory. Furthermore literature is found that identifies types of considerations for emergency response management. The reason for this is that it helps define solutions to the main research question by giving insight in possible considerations that are to be found. It thereby helps specify the further research direction.

Chapter structure

In the following section organizational theory is analyzed and a model is found that aids to determine tensions that might exist in the political / operational playing field. Different aspects of process, technology and institutions are examined too to determine how to use this. After this possible considerations that literature provides are investigated. A table is designed that gives direction to further identification of more specific considerations and finally concluding remarks upon the sub question are given. From this chapter it will be concluded why issues between political higher governmental layer and the operational layer may be expected; due to different views upon the problem situation. This means it is important to look at the view that is not yet represented in the change process which is the operational view. Furthermore general considerations (types) from literature are identified that will be investigated further.

2.1 ORGANIZATIONAL THEORY

In this section, the concepts used to analyze and frame the research are explained. Thee organizational theory will be discussed as it is used as the main lens for the research and helps understand the dynamics of the system. In the sections hereafter notions to the technological and process components are described and how these are used.

The goal of using a frame of reference in general is to bring structure into analyzing the system and come up with a clear problem definition. It should therefore not be seen as a blueprint but guidance for thinking about problems and developing solutions in a consistent way. Hence, a reference frame is used to increase the understanding of the complexities and to improve understanding concerning the fuzziness and capriciousness of the EDC environment.

Koppenjan & Groenewegen (2005) propose a generic model that helps in creating institutional designs in complex technological systems (Koppenjan & Groenewegen, 2005). The framework suggests that process design precedes the technological and institutional design.

The process design, includes questions of who, what and which roles are present (Koppenjan & Groenewegen, 2005). As a starting point however the author argues that first knowledge about the socio-technical setting is needed to identify these roles and the possibilities for process design. As the starting point is almost never a blank sheet, therefore the institutional analysis and preliminary design can precede and interact with the process design. This could also be the case for the technological design.

2.1.1 INSTITUTIONS

Institutions are structures that are arranged formally one way or another (Edquist, 2004). Institutionalization is defined by its behavioral characteristics which are stability, recurrence, repetition (Goodin, 1998) and therefore predictability (Koppenjan & Groenewegen, 2005). This implies also that they are hard to change. Looking at the emergency services institutions a lot of interdependent and institutions exist which are hard to influence. However the proposed and currently executed institutional (re)design shows that they are also subject to big changes over time. Literature also emphasizes institutions as playing a central role in innovation (Edquist, 2004). New institutional economics implies transaction costs are fundamental for a systems productivity, but according to Coase (1998) 'the costs of exchange depend on the institutions of a country… 'In effect it is the institutions that govern the performance of an economy'. This makes institutional design a fundamentally important subject. The notion from Coase (1998) suggests that knowledge of the institutions on macro level shape societal performance. Thus its systems should be carefully designed, by incorporating knowledge of the structures and characteristics of institutions.

Numerous difficulties need to be overcome when re-designing institutions, and trade-offs need to be made. Koppenjan & Groenewegen (2005) include in an institutional design 'the arrangements between actors that regulate their relations: tasks, responsibilities, allocation of costs, benefits and risks'. Thus the forces playing a role concerning tasks and responsibility

allocation are described as important. These forces and the incentives of different parties and their relationships have to be known to be able to design the tasks and responsibilities.

2.1.2 ORGANIZATIONAL STRUCTURE AND CHANGE

To investigate changing organizations it is helpful to understand its structuring. *"Effective process innovation may enhance organizational efficiency and responsiveness…however, innovation poses tremendous challenges…"* which is exemplified by the fact that *"…innovation may be highly disruptive, altering relationships across functional and occupational boundaries"* (Khazanchi, Lewis, & Boyer, 2007).

In this study understanding the structure of the organization means a.o. the understanding of the implications for coordination that arise from the inherent structure of the organization. Mintzberg (1983) proposes a model to rationalize these changes, put them into context and identify possible tensions. He structures organizations as consisting of five different parts and identifies dynamics that exist between these parts (pulls). The parts that make up the organization are the strategic apex, middle line, operating core and technostructure and support staff (figure 5).
The operating core is responsible for primary tasks related to the organizations products or services. They perform operations to 'transform inputs into outputs'. The strategic Apex consists of the management of the organization or government. They carry the overarching responsibility for designing and supervising on the organizations main goals, the strategy and policies. Middle line; the so-called middle management of the organization is defined here. They are the 'glue' between operational tasks and strategic goals. Dependent on firm size and structure this can involve direct supervisors to senior managers. The technostructure consists of analysts mainly responsible for planning and control tasks. Lastly the Support Staff is depicted. This staff is responsible for tasks not directly related to the primary operating processes. The PR, HR and administrative functions fall in this category. These tasks ensure that the rest of the organization can function properly.

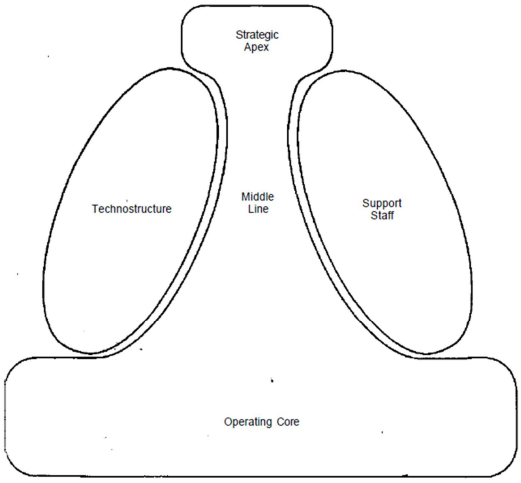


FIGURE 5 MINTZBERG'S FIVE ORGANIZATIONAL PARTS

Dependent on the type and size of organization each of the parts has different substance and dynamics. These organizational characteristics in turn have an effect on how the organization operates and on the way to effectively manage this.

When dealing with organizational changes on any of these levels an effect on other levels is to be expected. In public organizations where inter-agency cooperation plays a vital role there are a lot of actor interactions, which increases the complexity for effective task execution. It is therefore important to understand in this context the dynamics that are involved. With this knowledge it is possible to identify issues that arise from the fact that the organization is structured a certain way. Also opportunities can be identified to effectively manage and change these organizations.

The different parts of the organization 'pull' the organization towards a certain structural configuration. The configurations that can be the result of these pulls are the simple structure, machine bureaucracy, professional bureaucracy, divisionalized form or adhocracy. Also hybrid structures can be formed.

SOCIO-TECHNICAL SYSTEMS AND CHANGE

The previous section explains that changes in institutions can be hard to accomplish and that in dealing with these changes there are tensions to be expected between different parts of the organization(s) involved. Due to different aspects that have to be taken into account changes become more difficult. The implementation of change according to Baxter (2011) can be impeded by factors like a lack of understanding of the system, conflicting values, a lack of agreement on goals, a lack of shared understanding among different stakeholders and consequently their support. It is therefore essential that '…the organisational, social and technical aspects of the system are considered together…' (Baxter, 2011). The argumentation is that unanticipated effects can arise from changes that have their source at the business management layer. This is because of their background. Bounded rationality plays an important role as it is difficult to oversee the system as a whole. A system that requires looking at the different aspects can be defined as a socio-technical system. Difficulties in designing such socio-technical systems in general are the systems (technical) complexity, scope of design, stakeholder interests and requirements and imperfect and incomplete knowledge (bounded rationality) (Ruijgh et al., 2014). On top of this the changes over time complicate the robustness of the (re)design. Considering these difficulties a perfect design is an illusion, however taking them into account improves the chance of a successful system.

2.1.3 PIGEONHOLING

Standardization in a machine bureaucracy consists of standardized job sequences and single purpose structure with clear predetermined actions. This is therefore not suitable in every context. In a professional bureaucracy the operating core consists of specialists (professionals). Operators are categorized on the basis of their skills in order to couple them with issues that need to be solved (van Aart, 2006). This categorization, or classification process is defined by Mintzberg (1993) as pigeonholing. The concept of pigeonholing is important because

categorization in a professional bureaucracy is not perfect. Meaning that who is exactly responsible for what is not always clear nor always agreed upon.

To ensure or improve high quality of service there has to be agreement on this categorization. Coordination of tasks in this sense can be an issue, especially when innovations are implemented, which requires '...a rearrangement of the pigeonholes...' requiring interdisciplinary efforts (Mintzberg, 1983). Another important notion from Mintzberg is that coordination issues can arise when within the organization different parallel hierarchies exist (e.g. different agencies within the emergency dispatch center; police dept., fire dept. and ambulance dept.) These hierarchies can be organized or structured differently but do share a common goal, this can cause conflicts.

2.1.4 ORGANIZATIONAL PULLS

In the context of organizational change within a multi actor setting with interagency collaboration knowing which pulls play a role is important. The notion of these pulls is used in this research to identify if there are differences between different agencies and/or between managers and operators about structuring the organization. It can be reasoned which outcomes of the innovation process are to be expected, based on the approach taken, which forces play a role and how to manage these forces. Intergroup conflicts can be expected, which has a negative effect on the coordination of tasks between different parts of the organization (Schermerhorn, 2010). There are five pulls that play a role within the organization:

1. Pull to Professionalize; Operational staff seeks autonomy. A professional atmosphere is favored.
2. Pull to Balkanize; Balkanizing entails the goal to limit outside control and increase of your own span of control. A divisionalized structure can be the result, where middle management can more or less autonomously make decisions. Coordination is achieved by standardization of output.
3. Pull to Centralize; from top managers a pull towards centralization to achieve control over the decision making is exerted.
4. Pull to standardize; in contrast to the operational core the techno-structure wants to standardize work processes and increase uniformity over the whole of the organization.
5. Pull to Collaborate; by the support staff intra-organizational collaboration is advertised, because they coordinate with the whole of the organization and rely on effectively working together with them.

The pulls are displayed next to the model in figure 6. In general a balancing act between the pulls ensures stability within organizations. If changes in the organizational structure are proposed, this can have an impact on the balance of the pulls between different parts. As bureaucracies are generally stable and work best while being stable they are also not flexible. Balancing tensions between for instance standardization versus professionalization arise and have an impact on the outcome of the innovation processes. It depends on how to handle these tensions. This is a two-way street, as organizational parts will want to capitalize on changes if possible. Concerning

changes of public organizational structure it is important to know how this is organized. As different actor roles and tasks are influenced by these changes the models of Mintzberg are used to analyze aspects in the actor environment.

Figure 6 shows the pulls by Mintzberg (1983) that might be expected, considering the scope of the research. The scope of this research revolves around the operating core and strategic apex as most important entities. The differences in views that may exist and come to light can be placed in terms of pulls. There are three pulls that can be expected. A pull to standardize and centralize are expected from the government. A pull to professionalize, can be expected by the operating core.

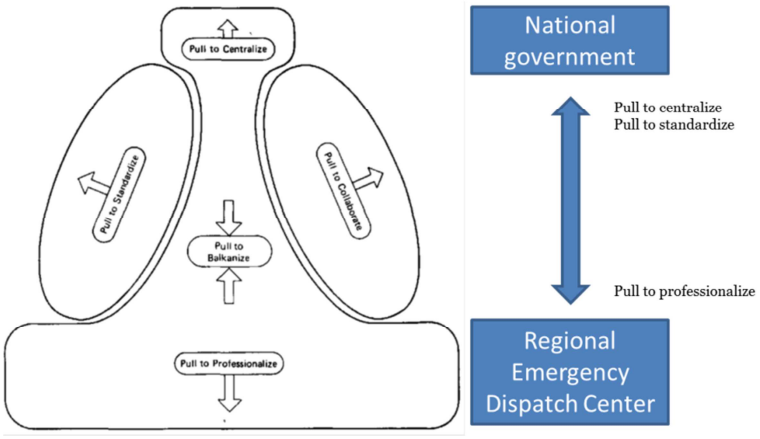


FIGURE 6 ORGANIZATIONAL PULLS EXPECTED

CHARACTERISTICS OF PROFESSIONAL EMERGENCY WORK ORGANIZATION

Work organization based on profession increases the complexity of changing or questioning work practice (Isomäki & Liimatainen, 2008). Emergency dispatching workers face the task of gathering and disseminating emergency call information. Their job consists of call handling and prioritization and acting upon availability of resources like availability of staff and road units (Blandford & Wong, 2004). These resources may be scarce in the emergency dispatching environment. For emergency information they fully rely on the caller's information. This information is often ambiguous, being incomplete or incorrect (Landgren, 2006). Coupling this with the need for quickly and accurately processing this information to ensure fast emergency response makes this a highly professional environment. In such a time-constraint complex environment skills and collaboration are important. Not only collaboration among dispatchers but also the effect of caller information is important. Research suggests that the short interactions between caller and dispatcher are of immense information source that includes descriptions of the type of emergency, needed help and by the piercing by dispatchers for useful context information (Imbens-Bailey & McCabe, 2000).

Though this research is limited to task division and collaboration within a changing emergency dispatch environment it is important to also note that the predefined mental models

(pigeonholes) are important for the perception of the information received. This selective perception, described by Schermerhorn (2010), implies that previous experience and background have an effect on problem identification. This can inhibit new insights and may lead to suboptimal solutions. The author defines this as a pigeonholing problem. A professional may see a threat of losing authority; however this might have a positive influence on the whole of the organization. Here tensions may occur, which can be defined as 'pulls'. This thus links the concepts of pulls and pigeonholing. Isomäki & Liimatainen (2008) argue that professional employees may have a desire for maintaining their position and current organizational structure.

2.1.5 TECHNOLOGICAL ASPECTS TO SYSTEM

According to Koppenjan & Groenewegen (2005) the technological system consists roughly of a demarcation of the system, its components their relations and processes. The demarcation of the system is a representation of the relevant technological aspects of that system including system components, their relations and ongoing processes. The components are elements used within the demarcated system, such as hardware and software. Relations describe the relationships between different components. Processes describe the processes active in the analyzed system. Analyzing these parts can help give explanations to the technical aspects as well as bring to front bottlenecks. The analysis of operational processes is explained in chapter 4.

2.1.6 PROCESS ASPECTS TO SYSTEMS DESIGN

The process aspect of analysis has as a goal to understand who is involved, who should be involved and how roles can and should be divided. Because the environment consists of actors with different knowledge, interests and functions within the system, the understanding is necessary to be able to cope with these differences to investigate the trade-offs that can be made. This analysis is used to answer the question which actors are active in a system and what roles they have. This is important because the tensions between different views on the system can then be explained.

When applying transitions to institutions it can be preferable to have parties agree on the chosen innovations and commit to the goals that are set. To reach commitment, commitment to the process is important (De Bruijn, ten Heuvelhof, & in 't Veld, 2010). Two steps to reach this should be kept in mind. First of all the actors should agree to the fact that there is an issue. If this is true then the view also has to be that collaboration is the only means to solve this problem. This is called the creation of sense of urgency which decreases opportunistic behavior (De Bruijn et al., 2010). From the premise that the governments intentions are just and cooperation is preferred, for this study that means that a sense of urgency improves the chance the innovations are carried out the way they were intended instead of only committing to the strict rules that the government can commit the operators to.

2.1.7 INTEROPERABILITY IN MULTI-ACTOR SETTING

In public multi-actor systems interoperability between different organizations can be an issue. According to Klischewski (2004) there are two "approaches" towards achieving cross-

organizational interoperability. Process integration focuses on the processes and their interrelations. Making sure that the different functional building blocks can work together to support the overarching processes is needed. More integration may then result in better access, more homogeneity (uniformity) and higher processing speed.

2.2 IDENTIFICATION OF POSSIBLE CONSIDERATIONS

An important notion from the previous section is that organizational pulls or tensions can exist because of different goals within different parts of the organization. In this section considerations are summarized and a means to identify and classify them is defined. Scholl and Klischewiski (2007) identify categories for constraints to organizational integration. In the authors vision they are more broadly applicable and thus also applicable to the research study. The following categories are defined; legal, jurisdictional, collaborative, organizational, informational, managerial, cost, technological and performance constraints (Scholl & Klischewski, 2007). These impose pitfalls and raise questions about who is the process owner, are horizontal and vertical integration necessary and desirable or even legally permitted? Horizontal integration of tasks can be an outcome of the transition process as desired by the Dutch government. These types of questions are defined in this thesis as considerations. 'Constraints' from Scholl & Klischewiski (2007) can be defined as boundary setting things that must be done. As this closely relates to considerations the categories they use are also found applicable to considerations. Understanding the considerations to take into account will decrease the chance of encountering problems and also gives handles to identify and classify them. Table 1 is filled in for possible considerations per type. The types of considerations were taken as base and emergency services related reports were found that express why these considerations are applicable for the public emergency service organizations. First of all the American (USA) emergency management system as described by Waugh and Streib (2006) underlines that the possible considerations can and do occur in various forms in the American system (Waugh Jr. & Streib, 2006). Furthermore the research of Canton (2007) into concepts and strategies for effective emergency management provides a lot of considerations that might be important and which can be categorized into the types by Scholl and Klischewiski (2007). On top of their reports other contributions were found and displayed in table 1. The 'types' overlap as issues also overlap. In that case the most suitable type is chosen for categorization. Also the goal is to distinguish different types and why they are important. Consideration types that have a lot of overlap are put together.

Possible considerations to effective emergency response service task arrangements	
Type of consideration	Consideration
Legal & Jurisdictional	*Responsibility assignment* "Major policy issues may arise out of the need to assign responsibility for (emergency response) tasks." (Canton, 2007)

	Authority and *Jurisdiction* "There may be insufficient legal authority to accomplish the new tasks." (Canton, 2007). There may be conflicts over jurisdictional issues concerning task according to Canton (2007). *Regulations* "Rules of the game reduce uncertainty and thereby uniformity of service. These legal 'rules' are subject to possible failure if the legal system does not match the way of working" (Klein Woolthuis, Lankhuizen, & Gilsing, 2005). *Power divide* It is a question how much power agencies should have. "…each agency tries to address a particular issue with specialized staff and processes" (Keith Smith, 2000).
Collaborative	*Task change* "Existing organizations may be reluctant to take on new tasks" (Canton, 2007). *Collaboration* "The importance of collaboration (while executing in emergency response services) is not to be underestimated" (Waugh Jr. & Streib, 2006).
Organizational & Managerial	*Knowledge* "…strategic issues require the in depth understanding of community politics and group interaction…They may also require the imposition of political will, emergency legislation, or a policy decision to ensure the integration of organizations and tasks." (Canton, 2007) *Hierarchy* "New leadership strategies are recommended that derive their power from effective strategies and the transformational power of a compelling vision, rather than from hierarchy, rank, or standard operating procedures" (Waugh Jr. & Streib, 2006) . "…attempt to impose a command and control system on a very collaborative organizational culture in a very collaborative sociopolitical and legal context is not recommended".(Waugh Jr. & Streib, 2006) *Structure / coordination* "A critical part of response strategy is the development of a governance structure and the fixing of responsibility for various response functions. Response involves the virtually simultaneous implementation of emergency, continuity, and recovery plans. A major strategic decision is whether these plans are coordinated from a single operations center by a single management team or from separate operations centers headed by different managers." (Canton, 2007)
Informational & Technological	*Procedures (protocols)* "At the operational level, standard operating procedures and protocols can be used to manage the crisis. As one approaches the level of a catastrophe, plans may need to be modified or discarded and new operational structures and procedures may evolve." (Canton, 2007) *Technology infrastructure* "The inability of responding organizations to communicate with each other is frequently cited in after action reports. This failure is usually attributed to the use of

	multiple communications technologies that prevent interoperability. Most failures that emerge from disasters are not technological in nature but rather reflect the inability of organizations to expand their internal communications structure to reflect the needs of disaster response." (Canton, 2007) *One-stop-shop* "completeness and timeliness of information released"…"can be improved by one-stop-shop approach to emergency management" (Ongaro, 2004).
Cost	*Training costs* "Cost estimation is at least necessary for instance for estimating training needs that might be necessary for emergency response. These need to be estimated for costs" (Canton, 2007). *Emergency management change costs* "In actual practice, plans are limited in their implementation to those things"…"by public or legislative pressure. This is particularly true in the emergency management discipline where program budgets are usually small and many of the major tasks to be accomplished must be funded through separate agency operating budgets. If these agencies are not committed to supporting the emergency management program, these tasks may not be accomplished owing to competition for funding with the agencies' internal priorities". (Canton, 2007)
Performance	*Qualitative assessment and improvement* Objectives might be to test the performance of new communications systems or to identify revisions for emergency operations center procedures." (Canton, 2007). *One-stop-shop* Sader argues that a one-stop-shop could improve performance, however "A one-stop-shop….would require profound changes to the structure of emergency service operations (Sader, 2000) .

TABLE 1 POSSIBLE CONSIDERATIONS TO AN EFFECTIVE THE SYSTEM

The above shows that different types of considerations exist in emergency response management. From this it is learned that in the transition it is important to look at these. From table 1 it is concluded that when applying transformations in the emergency services organization you should consider; the assignment of responsibilities, regulations, necessary task changes and their implications, structure and the impact on coordination, procedures (protocols) to manage emergencies, technology infrastructure interoperability, interagency collaboration, the one-stop-shop option, quality assessment and improvement evaluation and training and change management costs.

2.3 CONCLUDING REMARKS

The question of this chapter was:

> Which theoretical contributions aid to the understanding of effectiveness and (re)structuring of public organizations, and how can this be used to find and evaluate operations at the EDC?

The most important part for this research is the institutional transformation instigated by technology. The focus is on structuring in the context of organizational transition. Therefore the institutional analysis is important. The institutional setting is formulated in chapter 1 in terms of the current situation (IST) and desired future situation (SOLL). A number of types of considerations were found in theory which leads to insight in which directions to search for issues and solutions.

This chapter has brought to light that we can use organizational structures to define tensions in general. This is done by looking at the type of organization, the pulls from different layers and possible tensions resulting from this. This information is used in the chapter3 to define and chapter 4 to conclude if tensions in the emergency dispatch center exist and can become problematic when not addressed. In chapter 3 it is looked if they exist and what problems this can give by investigating the current and desired situation of emergency response services. In chapter 4 the operational technical- and work processes at the EDC are investigated, as literature has argues that not only the institutional side is important. The literature thereby provided handles to identify considerations to the effective organization of tasks in the Dutch emergency dispatch center. The pigeonholing principle explained in this chapter is used to identify in chapter 3 and 4 which issues might play a role in allocation of responsibilities for tasks, first on broad level and then on an operational level. The considerations found in table 1 help to structure the search for operational issues for task arrangement design. In the next chapter this table will be filled in with relevant issues for the EDC that were found by the conducted interviews and empirical documents. The literature found gives a starting point to the evaluation of considerations by identifying which types of considerations might be important.

3 THE CURRENT SITUATION OF THE EDC ENVIRONMENT

From the problem definition it becomes apparent that there are multiple uncertainties concerning the current and desired environment of the EDC. The front page of this thesis illustrates this effectively with its sketch of the contours of an EDC without being detailed about how it should be filled in. In chapter 1.2.1 the most prominent knowledge gaps were described. The first gap to examine was gaining a clear understanding of the current environment, its complexities and eventually the considerations that might be important. This knowledge made it is possible to look further into the detailed aspects of influence on operations. Therefore in the following chapter the current situation in the EDC environment is investigated. A clear overview of the current and future organizational structure is needed to get an indication about the impact on task arrangements. Semi-structured interviews and data gathered at the RR EDC have been combined in order to gain insight in the current environment. By investigating the current system, considerations that inhibit the design of high performing task arrangement are found from the process. The sub question on which this chapter tries to find an answer is:

> How can the current situation at the Rotterdam-Rijnmond EDC be defined in terms of organizational structure and operational processes and how are these linked to subsequent possible issues?

Chapter structure

The final answer to the sub question will be given in chapter 3.5 thereby reusing table 1 from chapter 2.2. .Firstly the emergency dispatch system and its formal structures are defined. As the literature in chapter 2 explains, a defined structure is important for investigating the ongoing transformation. This aids to understand the system and its complexities whilst giving room to identify considerations.

The operating core of the emergency dispatch center is positioned in the environment in respect to the national and regional organizations. This gives insight in the relationships that are present and show how organizations collaborate to provide emergency response services. Using the model by Mintzberg (1983) from chapter 2, characteristics of the current situation are further explained while the desired situation by the government is set as a goal in order to reflect performance. Using the table from chapter 2.2, it is possible to identify more specific (possible) considerations to task arrangement design.

3.1 Defining the emergency dispatch system

The emergency dispatch system can be defined as a socio-technical system. The term socio-technical implies in the author's view that it is a system comprising of both social and technical structures as well as the interactions within and between them. In the Emergency Dispatch Center interactions are clearly present in the form of dynamics between employees, departments and employees vs. computer systems. These interactions are furthermore bound by agreements and regulations which also partly define the success of the system. As explained in chapter 2 this has implications for analysis and design of such a system.

3.1.1 FORMAL STRUCTURES AND RULES IN THE EMERGENCY SERVICES SECTOR

The emergency services sector is defined as the environment in which emergency dispatch centers operate. In the Netherlands the police-, fire-, ambulance and public risk management and crisis management departments are distinguished as organizational bodies carrying out different parts of health, safety and crime response. Dutch public safety is a task of the Dutch government. Different aspects of managing public safety are carried out on different organizational levels, by different public bodies. These bodies have different organizational structures. Some tasks are nationally coordinated and others are regionally or locally organized.

NATIONAL GOVERNMENT

There are four Dutch ministries, with its Ministers as head, which are responsible for different aspects related to safety and emergency response. The Ministry of Safety and Justice is responsible for the laws and policies concerning safety. The Ministry of Health, Welfare and Sport is responsible for healthcare and thus also ambulance care. The Ministry of Defense has a role in emergency situations as well. The Royal Military police (Dutch: Koninklijke Marechaussee, KMAR) operates under this Ministry but also under the Ministry of Safety and Justice(Ministry of Defense, 2014). Furthermore the ministry of National Affairs (BZK) has an indirect role in case of emergencies, e.g. via city mayors. To remember from this is that decision making authority lies here in the higher government.

It is hard to grasp the complexity of the possible possible tensions between this decision making authority and executing bodies. In order to get a feeling about the relationship between actors, an extensive analysis of actors is presented including responsibilities within the emergency response services field is given in appendix A.9. The whole of public organizations that are involved in emergency management, emergency response and safety and security can be defined as one large public organization, divided into professional and functional departments on different layers. Simplifying it this way makes it possible to position the organizations present in the emergency dispatching center.

National laws

The Law on safety regions (Dutch: Wet veiligheidsregio's, Wvr) which entered into force in 2010, has replaced the fire services Act, the medical assistance in accidents and disasters (Wghor) act and the disasters and serious accidents (Wrzo) act. These separate laws for the different emergency services have been combined into a new law. This law regulates and decides the division of tasks for different agencies responsible for aiding in case of emergencies (Ministry of Safety and Justice, 2010). This means that the different emergency response agencies have different responsibilities with respect to their role within the dispatch center. Furthermore different functional profiles are thus created for operator in the EDC (Ambulancezorg Nederland, 2009; Meijboom, 2015; Veiligheidsregio Rotterdam-Rijnmond, 2011).

The Wvr is the basis for organizing the emergency services sector. Next to this the 'temporary law ambulance care' (Dutch: Tijdelijke wet ambulancezorg, Twaz) is set up in 2013. This regulates the responsibilities for regional ambulance care (Dutch: Regionale ambulancevoorzieningen; RAV) and the demands for qualifications of personnel which are not stated in the Wvr. The law on professions inn the individual healthcare (Dutch: Wet op de beroepen in de individuele gezondheidszorg; Wet BIG) is also part of the ambulance care law.

The Wet BIG describes the responsibilities of healthcare workers. It includes rules for registration of healthcare workers. There are a lot of in depth rules on how agencies should perform. The Dutch police organization is currently undergoing transitions as a national police organization replaces the regional ones. The Police Law (Dutch: Politiewet) of 2012 handles these responsibilities. It can be concluded that there is a large administrative and legal diversity in the EDC domain (pwc, 2015).

The content of this section shows the sector is highly regulated and procedural. For example, there the laws that determine operations, which are for instance very specific for police, fire and ambulance care road units according to De Wit, when designing a task the boundaries are set by these laws (Personal Communication: De Wit, 2014).

REGIONAL GOVERNMENT

The Netherlands is divided into (25) safety regions which all have the responsibility of organizing, operating and maintaining the safety related tasks within their region. Safety regions have been assigned by law to manage a combined Emergency Dispatch Centre (EDC) of police, firefighting dept. and ambulance (source). This resembles a shared services center of separate organizations. They are located in one place, share information and work together.

Different hierarchies exist throughout the agencies. Regional police organizations answer to the national police, which is in a transitional phase. Next to the above tasks, the safety regions have the tasks of risk management, crisis management and incident management within these regions. The Mayor of the biggest city in a region currently services as the head of each safety region.

The LMO, as introduced in chapter 1.2, is intended to become the new organizational body responsible for emergency dispatching services. It will replace the 25 regional organizations and

will manage the ten new EDC's. The formal relationships and laws that make up the environment are depicted in appendix A.9 figure 39. The figure reveals the outcome of the general analysis of actors. It is a very large arena of actors which have different depths of involvement as it comes to operations at the EDC.

The hierarchical structure is clearly visible in the sector, meaning that the decisions are made at the higher levels where execution of tasks done at the operational layer. There are a lot of agencies linked to each other formally (see table 6, table 7), and informally (not on paper). Hierarchies exist next to each other, as explained in chapter 2. This can cause conflicts. In this case the three agencies of police, ambulance care and fire dept. share a common goal, but have different hierarchies. This has an effect on rules and ways of working on the operational scale. Changing this into an oiled machine with multi-intake is not easily achieved. This is a reason why the intended transition did not go smoothly until now. Examples can be found in the National Police, which was set up in 2012.

In the process of setting up this project, which is currently still running, unexpected problems became apparent on the operational level due to for instance geographical knowledge disappearing due to the centralization efforts (personal communication: Huizing, 2014). Classification of responsibilities can also become problematic as formally responsibilities are 'vertically' agreed upon in the hierarchy, while tasks have to be coordinated horizontally.

From the large list of involved actors, of which some have been described above, a small group is identified in which the parties have a direct connection or indirect connection to operations in the EDC. This also goes for laws that might be important. It does not mean they are all equally relevant however this group establishes the relations and subsequent link to the organizational theory.

The relationships were discussed during personnel communications with experts at the RR EDC (personal communication: Swets, 2014) (Personal Communication Huizing, 2014). These interviews were used to further specify relevant parties for further research. This is displayed in figure 7.

The dynamics within the EDC are the subject of research, but it is important to visualize them within the entire actor field (appendix A.9). Both internal as external factors play a role. Internal interaction and responsibility allocation might be important, and as discussed in chapter 3.1 externally laws and regulations should be considered too. The interactions can be related back to the inherent hierarchical structure of the public organizations. Therefore the Mintzberg model is used to place the relevant parties in context.

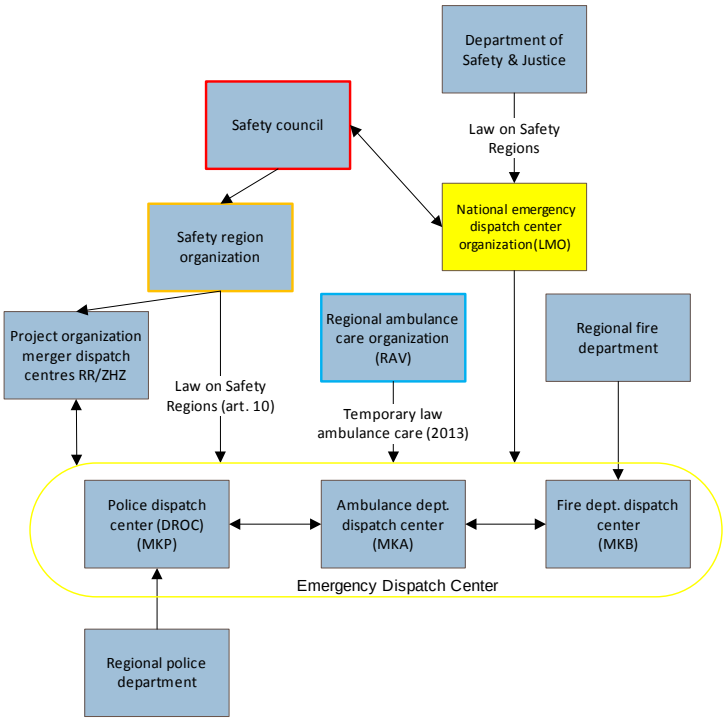


FIGURE 7 FORMAL RELATIONS BETWEEN IMPORTANT ACTORS

3.1.2 THE DUTCH EMERGENCY DISPATCH CENTER

Figure 2 now zoomes in on the emergency dispatch center itself.. The integral information hub for emergency response is the EDC of police, fire dept. and ambulance. This is the heart of the operation of the emergency services in the provision of assistance, incident prevention and crisis management. Figure 8 gives a general representation of the co-located dispatch center, with four disciplines located in one emergency center. The three entities handled in this study are the police dispatch center (MKP), ambulance department dispatch center (MKA) and fire department dispatch center (MKB).

The 'risk & crisis management' is out of the scope of this research. The organizations manage and steer the emergency response units on the road within the region in case of emergencies and instantiated by emergency calls. Coordination between the different agencies involved entails accounting for differences in technology, applications, processes and information (Bharosa et al., 2009; Diehl et al., 2000).

There are different ways to manage the tasks in order to achieve a common goal. From the notion that governance needs high quality information, knowledge of the information flows between the EDC and its large amount of partnering agencies is thus very important. Partners of the EDC are the organizations with which the EDC communicates and cooperates, parties which

regulate and coordinate the EDC and different parts in the EDC. Quality of service is an outcome of the coordination as posed by Bharosa et al. (2009).

In the interviews during the analysis phase (Appendix A.10) it came to light that concerning the cooperation between partners there were doubts and uncertainties about the reality of the premises on which the transformational changes were based. Especially the political premise of quality improvement was questioned.

> **"It is higly uncertain if the quality will be as high as it is now when the intended changes are implemented in operations" (Interview: Den Hollander, 2014)**

The differences between the procedures, ways of working and governance mechanisms between safety regions, due to e.g. the population density of the region on national scale, or employee background on a local scale, can have a negative impact on information sharing and overall quality of service (Canestraro, Pardo, Raup-kounovsky, & Taratus, 2009; Pardo et al., 2004). Not only on national level, but also on a local level differences are found. There are differences between the operational organizations that might have an effect on how tasks are carried out. It thus seems important to look into this. In chapter 3.3 the desired situational characteristics are therefore explained more deeply. Then in chapter 4 the implications for operations are worked out. In appendix A.6 a more detailed description of the different departments is given.

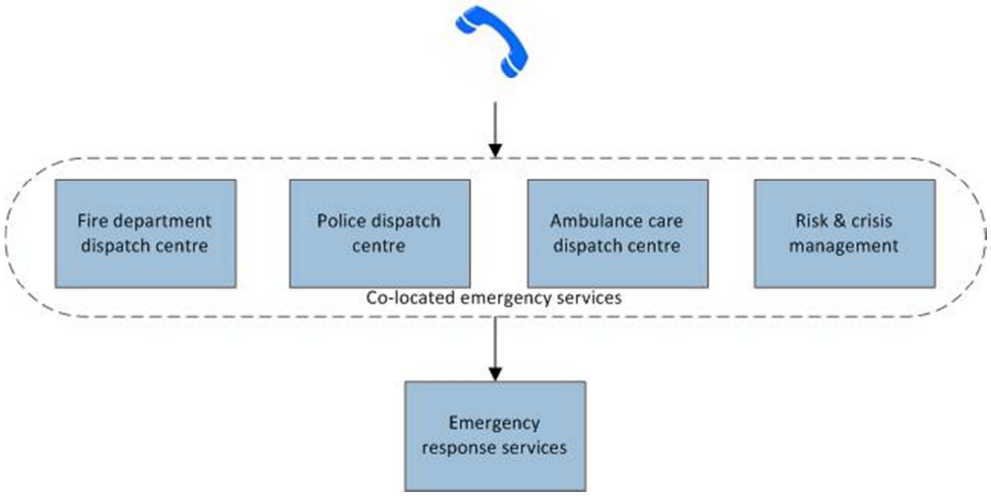


FIGURE 8 EMERGENCY SERVICES BASIC SCHEME

For the new EDC organization, one of the questions posed is which amount of integration can be achieved and is this desirable? Also the effect of this on the performance is unknown. (Personal communication: Hartman, Huizing, Langerak, Meelis 2014). This means that the considerations that might be important need to be evaluated to find out the effect.

In the EDC emergency service organizations are co-located, but information is currently often strictly divided (by law or otherwise) (personal communication: N Bharosa December 2013). This can be a problem for quality of service, because different agencies handle the (privacy) information they receive differently.

This section touches the surface and explains the emergency response sector in general. It is shown that a lot of organizations play a role, a lot of relationships exists from which complexities arise. Issues arising from an institutional transition may become apparent from the way the organization is structured and the rules that are present. A deeper insight is needed in the particulars of the EDC within its environment. In the next section the EDC is positioned within the emergency services sector according to the organizational structure and change models of Mintzberg (1983).

3.2 POSITIONING THE EMERGENCY DISPATCH CENTER AS OPERATIONAL CORE

The organization responsible for emergency dispatching services is a professional bureaucracy in pure form in the fact that it on operational level relies on skill standardization and personal expertise. However, within different layers different substructures exists that are more adhocratic or more mechanistic. The inherent differences in managing these different types effectively make it difficult to manage the structure as a whole. The positioning of the EDC as operational core is done by using the Mintzberg model. (appendix A.2, figure 28)

Within the operational core (as the emergency dispatch center can also be called from now), the different disciplines work according to several types of schemes. First off, the premise is that agencies strive towards the same goal; namely providing emergency dispatching services to the highest possible standards. This is endorsed by observations and discussions at the RR EDC (personal communication: de Wit, 2014). However, different kinds of demands are present.

The professional bureaucracy generally gives its operating core freedom over work. In general sense this is true for the EDC as the organization relies on the expertise of the operators. In that sense even characteristics of an adhocracy could be assigned where the specialist is free to organize his job as he is best suited to do so (Mintzberg, 1983). In the case of an emergency dispatch however, this bureaucracy is not acceptable. On the other hand it is visible that a lot of mechanistic principles are in place. Protocols for answering emergency questions decrease the professional space of the operators. In case of ambulance care operators this leads to such little a constraint that it may almost be totally protocolled and no professional freedom is left (personal communication: den Hollander). For pragmatic reasons and because of the level of abstraction that is chosen the structure is basically defined as a professional bureaucracy, but it should be noted that this is not a rigid definition, but a good starting point to examine if there are differences in the perspectives of different agencies and layers in the organization.

The emergency response organization steers on output as well. Factors as the duration of emergency call and average response time at the scene are used as factors for the quality of

service (personal communication: De Wit, 2014). These factors though very important are not the only ones important for determining the overall quality. Arrival time does not imply that the help given was also up to par (personal communication: De Wit, 2014). Steering on output alone thus falls short.

The tension here exists between top-down (machine bureaucratic/centralization) steering and bottom-up (professional) in which innovations cannot directly be pushed down from the top. Operator at the RR EDC Detmer Zandstra argues that in case the current transition is implemented strictly; "Specialism is going overboard but is really necessary and should be kept. You can't centralize the new situation without giving up quality" (interview: D. Zandstra, 2015). Another operator says that innovations should not decrease professional freedom. "If the amount of professional freedom is decreased my job will become more and more assembly line work, which is bad for quality" (interview: M. Bos, 2015). The decision makers assume quality will go up in the new situation. Tension is thus expected thus between the operating core and the 'strategic apex', which is the definition for the decision making authority (national government) (see appendix A.2).

As explained in the previous section and is depicted in figure 8 the ambulance operator is part of another organization then the police operator and fire dept. operator. They need to work together but the hierarchical structures of the organizations are different (appendix A.2). Different national and local laws and regulations apply. E.g. ambulance care operators need to be officially BIG licensed, in contrast to police or fire dept. operators. This can be problematic and therefore the operational structure has to be investigated thoroughly in the next chapters.

As now the organization is defined according to the Mintzberg model described in chapter 2, the pulls that play a role can be identified. These pulls or tensions can involve considerations to an effective system. As described in chapter 2, a balance usually exists between pulls. This ensures stability within the organization which is important for overall performance of the organization.

The proposed changes have an impact on the balance of the pulls between different parts. Taking in mind the organizational re-design of which actor behavior can be deduced. In the upcoming paragraph I will describe the different pull- forces and explain how they affect the behavior and outcomes.

- Pull to professionalize.
    - Job of dispatchers is professional as explained. Operators will want autonomy to their job within the set boundaries. If you change these boundaries the operators will likely stand up against this if it means they lose this autonomy or even their job (Mintzberg, 1983) (personal communication: de Wit, 2014). They may thus be negative towards increased amount of protocolling. There is a clear link with the pull to balkanize:
- Pull to balkanize.
    - What came to light in initial interviews with experts at the emergency dispatch center is that the different agencies have different ways of working in a sense that

because of different regulations one agency is more bound to rules and protocols, than the other (personal communication: Hartman 2014)(Personal communication: de Wit, den Hollander, 2014). This leads to mutual coordination problems when working together. Keeping the expertise divided (balkanizing) increases this issue. This relates to the proffesionalization pull that autonomy and collaboration may inhibit each other. Problems can source from different things. One possible source is rules. "We can't share always the civilians data with the other agencies" (interview with a Rotterdam Rijnmond ambulance care centralist; anonymous, 2015).

- Pull to centralize
    - The proposed innovations are a top-down measure inspired by the government. Typical centralization steps are taken to improve uniformity. The set-up of a national organization (LMO) is one prominent example. The centralization is also cost driven. Cost driven innovations cannot easily be translated into operations because of the discussed hybrid structure of bureaucratic organization. Therefore costs and uniformity are issues and possibly involve trade-offs to take into account. The strategic apex has all the decision making power. Therefore requirements the strategic apex set will be very important for the execution of tasks. The pigeonholing process can become easier in case of centralization, dependent on how it is actually arranged, however it is unknown if another classification leads to a higher quality of service. Therefore it is needed to look at what the desired situation exactly entails and which measures influence the outcome. This is done in the next section.
- Pull to standardize
    - From the transition agreement signed by the national government it is clear that standardization is a goal (Ministry of Safety and Justice, 2013). By implementation of a central reference architecture (VERA) and central technical systems for emergency dispatching (Dutch: Nationaal Meldkamer Systeem, NMS) standardization is improved according to the government (Van Den Dulk, McEwan-Verver, Peters, & Van Vliet, 2012).

All of the above lead to the conclusions that the decision to make organizational change drives the desire to centralize and does not necessarily and obviously lead to a new desired situation under current circumstances.

It has become clear that considerations are present because of tensions between the political and operational side. The content of these considerations has to be examined further. It should be examined how exactly processes are organized currently, how changes affect operations in the desired situation. With the differences that are found considerations from the operational perspective become clear.

3.2.1 CONCLUSION OF CHARACTERISTICS AND USAGE OF THIS INFORMATION

The current and desired situations are different. These differences should be examined to find out if the desired situation is an improvement in terms of performance. In this section it is explained that that the amount of professional freedom is found important. The behavior of operators towards scenarios in which they lose this freedom might be negatively judged by them. Therefore this is something to take into account. In chapter 4 this will be further explained.

The tensions that are found from the 'pulls' are conflicting with rules/regulations. Moreover, the need for knowledge and translation of a cost driven innovation which may go hand in hand with trading-off other important aspects might lead to a complex formula. Operators have limited influence on the decision making. However considering that the goal is to get to a system in which civilians can be helped in the best possible way, it is important to look at the operating core and find out if the issues are really going to be problematic. It is clear that though the emergency response sector can be seen as one large public organization the operational and managerial parts are two separate worlds, with different views on the system.

3.3 CHARACTERISTICS OF THE DESIRED SITUATION

The desired situation and intended benefits should be investigated. First of all the specifications of the system are determined iteratively throughout the analysis and consist of different technical, institutional social requirements for the system to be. Process requirements are volatile and should not all be seen as set in space definitions for the to-be state of the design (Sage & Rouse, 2011). The government has weighed goals beforehand and designs the requirements. These are based on (assumed) goals of delivering high quality, against low costs and thus high efficiency of the system.

These trade-offs are made beforehand while considering other goals of the government in other domains as well. They have to weigh all considerations in assigning funds to each governmental service. This weighing has a consequence on possible outcomes of the system. It namely poses boundaries. As they are not seen as set in space, they are considered desired end-states, while keeping in mind the volatility of design and complexity of reaching the end-state considering a lot of hurdles.

The requirements are put into categories based on their importance and represent required aspects of the desired state. A must have is a requirement which can be seen as constraint to the new situation. Want to haves are important but not critical and nice to have requirements are of tertiary importance. Most must haves are instigated by demands from the government (Ministerie van Veiligheid en Jusitie, 2013). The must haves are imposed by the government, and thus entail criteria or boundaries for the new situation. The effects are however unknown and thus need to be further investigated.

In Table 4 in appendix A.3 a summary of these requirements is given. The must-have requirements need to be investigated further on impact and bottlenecks for task arrangements. These requirements for the system are laid down (top-down) by the government. The substance and or way to execute them are not yet fully developed. The requirements have an impact on the possibilities for Emergency Dispatch Centers to implement changes.

BUDGET CUTS

Costs in general are a big constraint to operations. In an ideal world costs are no problem, however the government needs to manage scarce funds. In general a trade-off between costs and other important aspects exist. The structural budget cuts as depicted in appendix A.5, can have severe implications on the carrying out of tasks on operational level. What this impact exactly is has yet to be investigated.

AMBULANCE CENTRALIST PROFESSION

Need for educated ambulance care personnel is a boundary setting requirement. Furthermore for the last two years ambulance centralists have had to work with the proQA protocol and be certified for this (personal communication: Donker, 2015). It means that scenarios for dispatching ambulance related calls must be done by a certified ambulance care specialist. This constrains possibilities to task arrangements and might constrain collaboration.

> **"Currently a fire department operator can't *not* send ambulance units because he is not allowed to make this decision." (Interview: ambulance operator, 2015).**

MULTIDISCIPLINARY OPERATORS

Currently the intake is done mono-disciplinary which means that police operators handle police calls, ambulance operators handle ambulance calls and fire department operators handle fire related calls. In case of a combined call cooperation is needed between the agencies by sharing information or putting through to an operator that is most knowledgeable. This is done on professional consideration. The government wants to merge the disciplines and create one multi-disciplinary (multi) operator that can handle all types of calls. If knowledge is insufficient backup operators from the different disciplines are used.

Moreover fewer operators are deemed necessary. The multi-intake scenario has to be further investigated to know the actual impact. It implies a lot of extra knowledge needed for the operator job. This can give friction with another requirement; the need for educated ambulance care operators. It means that every operator should be certified, as else no ambulance calls can be handled.

Policy considerations are needed which have not been taken into account until now. It is unknown what the exact effects on operations are of multi-intake versus mono-intake, so

therefore in the next part it is zoomed in into the operational characteristics of the current and desired situation.

ONE-STOP-SHOP

One of the goals of the government is to help the caller in the first contact as much as possible (Ministerie van Veiligheid en Jusitie, 2013). Argument is that this will improve coordination and collaboration as responsibility division is more clearly and easily defined (personal communication: Swets, 2014). Helping the caller in the first contact is called a one-stop-shop and its goal is to create one specific interface for communication (Ongaro, 2004).

As explained the government will introduce multi-intake which means a responsibility shift. Responsibility is given to the one-stop-shop. This will mean the multi-intake operator becomes the only one responsible concerning the end-user (Ongaro, 2004).

This improves the pigeonholing process if it is possible to achieve this because classification of emergency types is done by the operator and will be investigated further in the next chapter. A lengthened intake must ensure that there is a backup possible when the multi-intake centralist needs help. This is thus not a 'true' one-stop shop. The reasoning is that eventually less specialists (MKA, MKP, MKB operators) are needed in total, but are present in case handling the emergency call is too complex for the multi-intaker.

QUESTIONING PROTOCOLS

The fact that protocols need to be in place determines the boundaries for professionalization of the work in the dispatch center (personal communication: Hartman: 2015). Regulations are leading for task operations and this requirement is therefore important. More or less protocolling can influence uniformity of dispatching, standardization of work and on support by information systems. As visible in table 4, standardizing as much as possible is also a government wish. This may improve uniformity but might collide with professional interests of operators.

The lack in setting up the requirements is that they mainly have been designed by the government, without thorough research on operational consequences.

3.3.1 POSITIONING THE TRANSITION PROCESS

As described in chapter 2, from theory about socio-technical systems it is learned that two issues will arise. Because of the bounded rationality principle it is impossible to foresee all the effects in such a complex system in which no one person has the total overview. Furthermore differences between layers cause an arising lack of consensus about what is important. The selective perception of operators contributes to lack of consensus (Schermerhorn, 2010). As the transition requires interdisciplinary efforts, an agreement is needed on this behalf. The proposed solution has an unknown effect on overall performance, thence further investigation is needed.

Until now the government layer has only limitedly used operational expertise. As a result, the operational pulls can become problems. It is assumed that the government has not investigated in-depth operational role implications of intended changes in the beginning of the process. This

assumption is made based on the documents investigated. The transition agreement does not show details, nor do the data investigated at the RR have an answer to the implications on the operational system of the intended changes (Bakker, Kronenburg, Monasso, de Reuver, & Woudenberg., 2011; Ministerie van Veiligheid en Jusitie, 2013). By the national project organization a document has been set-up during this thesis research which endorses the issues described in this study (Beld & Menkhorst, 2014).

For the process the most important issues they have determined. These are described as that the development of multi-intake leads to two different beliefs; 1. In working according to the system, or working with the system standardization efforts can be hampered if stakeholders do not agree about the protocols (way of working). 2. The process of coupling of systems is also possibly problematic. This should be investigated (Beld & Menkhorst, 2014). The above may lead to issues for the process as a lack of commitment from professionals (though they aren't powerful) can lead to suboptimal results.

Considerations on an operational level can be derived from the requirements. The concern is about must have requirements that have to be met, (e.g. regulatory boundaries). The issues are explained in the next section.

3.4 CONSIDERATIONS FOR EFFECTIVE TASK ARRANGEMENTS

In this section the possible considerations that have been discussed in this chapter are classified. On this basis table 2 has been filed in.

Possible considerations to effective task arrangements	
Type of consideration	considerations
Legal & Jurisdictional	**Demands to skill and BIG registration for ambulance personnel. Demand for (increasing) usage of protocols (proQA).** **Constitutional task division transformation between police, fire dept. And ambulance care operators.** **National jurisdiction (and thus coordination) of police, versus regional jurisdiction of other agencies**
Collaborative	**Mono- to multi-disciplinary intake requires different types of collaboration.** **Past experience, and way of working differences (e.g. different hierarchies and historical organization) may inhibit collaboration, as explained this is the case in the EDC (Scholl & Klischewski, 2007).**
Organizational &	**Different opinions between and y within layers lead to organizational pulls and**

Managerial	tensions. Organizational changes to the 'pigeon holes' can lead to suboptimal performance. The standardization wish of government may not be shared by the operational layer. As explained, operators have limited influence, but a lack of consensus may impede collaboration, and operators might have less commitment which can impede the overall quality of service. From chapter 2 it was found that commitment to the process can be important (De Bruijn et al., 2010).
Informational & Technological	A difference in procedures between agencies and difference in rules obstructs information sharing. In the EDC emergency service organizations are collocated, but information is divided. The desired of the government to integrate systems can mean that information sharing and privacy issues need to be traded-off It is a consideration how to arrange/improve the information landscape to optimize the system. (Personal communication: Hartman, Huizing, Langerak, Meelis 2014). Heterogenic systems between RR and ZHZ impose threats on cooperation. Protocol usage should be aligned with technology design. Currently 86 systems divided over the agencies and different systems used by different agencies. The systems now are designed on specific agency needs (personal communication: Felius, 2015).
Cost	Budget cuts imposed by the government constrain the possibilities for designing an optimal system.
Performance	From the requirement of the government to help callers in the first contact the bottleneck to be expected is that of collaboration or task content in case of introducing a one-stop-shop. High quality of service is one of the indicators of system performance.

TABLE 2 CLASSIFICATION OF CONSIDERATIONS

When comparing the theory with the filled in table similarities are found in the types of considerations. What is seen is that collaboration differences are expected when changing task arrangement, which may be inhibited by the fact that operators are used to their own current ways of working (see table 1). Laws can be imposed according to literature (table 1) but conflicts might arise between legal demands and task execution (collaboration). Also different views on how the current and future situation affect the quality of service, that is an indicator of performance, as well as the fact if a one-stop-shop principle versus task content versus knowledge needed for the tasks. Relations may exist that involve trade-offs between these aspects.

The next question is how these really play out on the operational level. The multi-intake scenario has to be further investigated to know the actual impact. This could be a scenario that should be evaluated. Therefore knowhow of the tasks and processes is needed, which are described in the next chapter. Table 2 provides a reference frame for the issues that are to be found.

Constraints to the system from laws are apparent. These are 'must-haves' (appendix A.3). Next to this there is a discussion about education, making the job more suitable for higher educated personnel, which increases operational and training costs. Cost effectiveness is important thus the cost type consideration needs to be evaluated (Canton, 2007). Guaranteeing quality is found an important aspect and the tension field between professional freedom and standardization is too.

Concluding;

Difficult to solve tensions between operational and political views are present. These tensions need to be taken into account because they complicate changing the current situation and achieving a desired task arrangement that is agreed upon. Considerations concern politics versus operations, collaboration (e.g. way of working), costs (importance and as a boundary), performance (quality of service), information systems (adaptability), knowledge need and legal procedures.

To find the real discrepancies between the current situation and desired situation and to find out if these issues can be solved and what to take into account an in depth operational analysis is done in chapter 4.

3.5 CONCLUDING REMARKS

In this chapter the characteristics of the current situation have been examined. It has become clear that the tensions that Mintzberg (1983) explains can become present in the case of the EDC restructuring. There seem to be differences between the current and desired situation that aren't easily solved. Boundary setting laws, budget limits, collaboration issues that are foreseen when changing the current situation and a possible lack of consensus on the to-be state of the system are identified. To investigate which are the exact issues in the next section the operations are further investigated to define the exact differences between the IST and SOLL situation. This will lead to considerations for changes to the arrangement of tasks. The current processes have to be well known as well as the desired task arrangement. With this criteria can be set up that can determine the performance of a task arrangement. The next chapter will thereby answer which criteria can be used to evaluate a task arrangement.

4 CASE ANALYSIS OF OPERATIONS AT THE EDC OF ROTTERDAM-RIJNMOND

Chapter structure

In this chapter analysis is described of the operational layer to further explicate if the considerations identified in the previous chapter pose considerations to designing effective task arrangements in the EDC and which specific issues should be evaluated. Thence an understanding of which issues are most prominent and how issues related to the proposed institutional changes affect the operational core and affect each other is reached. First general processes are analyzed and then current and future processes are thoroughly described. The differences that are identified lead to the final specification of considerations in section 4.2. From the considerations criteria are made to evaluate. In section 4.3 scenarios for evaluation are derived.

The complexity for designing solutions for innovating socio-technical systems is underlined by the fact that initial research and interviews gave very distinct pictures of reality, or better said the view of actors on the reality. (I.e. the author observed that different actors understand the current organizational context and processes differently). The obstacle therefore is to get a clear picture of the current operational situation (IST) and the differences with the desired situation (SOLL). With this knowledge then evaluation criteria can be designed. The goal is to define how the most prominent criteria can influence the service of emergency dispatching. The sub question for this chapter thereby is:

> Which considerations/criteria to designing a (new) way to arrange operational tasks at the RR EDC are important to evaluate and how ?

4.1 OPERATIONAL PROCESSES AND ACTORS AT THE EDC

The operational perspective has to match the desired situation that has been proposed. Theory already suggested possible pulling forces and structural bureaucratic innovation problems that can or conflict with these effects contradict. Also there might be different operational tensions visible. This has not been investigated yet. The goal is therefore to take the operational side into account as well as the true effects of the desired situation depicted here.

4.1.1 OPERATIONAL PROCESSES

To model the basic emergency handling process an IDEF0 diagram is used, because it can represent activities, processes, operations and actions within the EDC as well as the data used for each activity (Dorador & Young, 2000). Figure 30 in appendix A.5 shows basic processes of emergency call handling. A more detailed description of the current and future process is shown

in figure 31 of appendix A.5. The description of the current process serves as a benchmark. What aspects of operations in the currently stable environment will change and which effect it will have on overall performance was defined as consideration. The IDEF0 diagrams show a high level picture of the process. With this I was able to identify that the intake task is undergoing the most changes.

The process of handling an emergency call at the EDC consists of several steps, actors and systems that interact with each other. From the theoretical context it was learnt that the technical components concerned consist of a demarcation of the system, its components their relations and processes. Through an iterative approach using available literature and shadowing at the Rotterdam-Rijnmond EDC a model of the business processes was designed using BPMN modeling. The model was validated by interviews with three different experts (personal communications: de Bakker, den Hollander, de Wit; 2014). This has resulted in a BPMN model, of the current an dof the desired situation. In 10 the current processes are shown. In appendix A.5 figure 36 shows the desired situation that has been modelled.

The models are validated with multiple experts. The choice to do this was made because from the start of the research it was apparent that different experts perceive their environment differently. Also different experts sometimes only knew part of the processes in depth which required to interview multiple experts to get the complete picture. By a thorough validation to improve the model, a true picture about what current and desired situations look like is created. The interviews with supervisors Den Hollander and De Wit, project leader B. Swets, and safety region ZHZ crisis management coordinator A. Bakker were done during the analysis phase of the research. A full list of interviewees is displayed in Appendix A.10

The level of abstraction and the inclusion or exclusion of processes or data blocks are based on the level of abstraction used in the study and relevance for it. Representation on a higher or lower level would increase or decrease complexity hence making the model less fit for purpose. Furthermore activity blocks purposely involve redundancy (intake police, ambulance dept., fire dept.) for better visual representation of the EDC. A thorough explanation of the figure is given in appendix A.6. This figure gives insight in which bottlenecks are most prominent for developing task arrangements and thus which criteria are important for design. It also forms the benchmark for analyzing differences with the desired situation by the government.

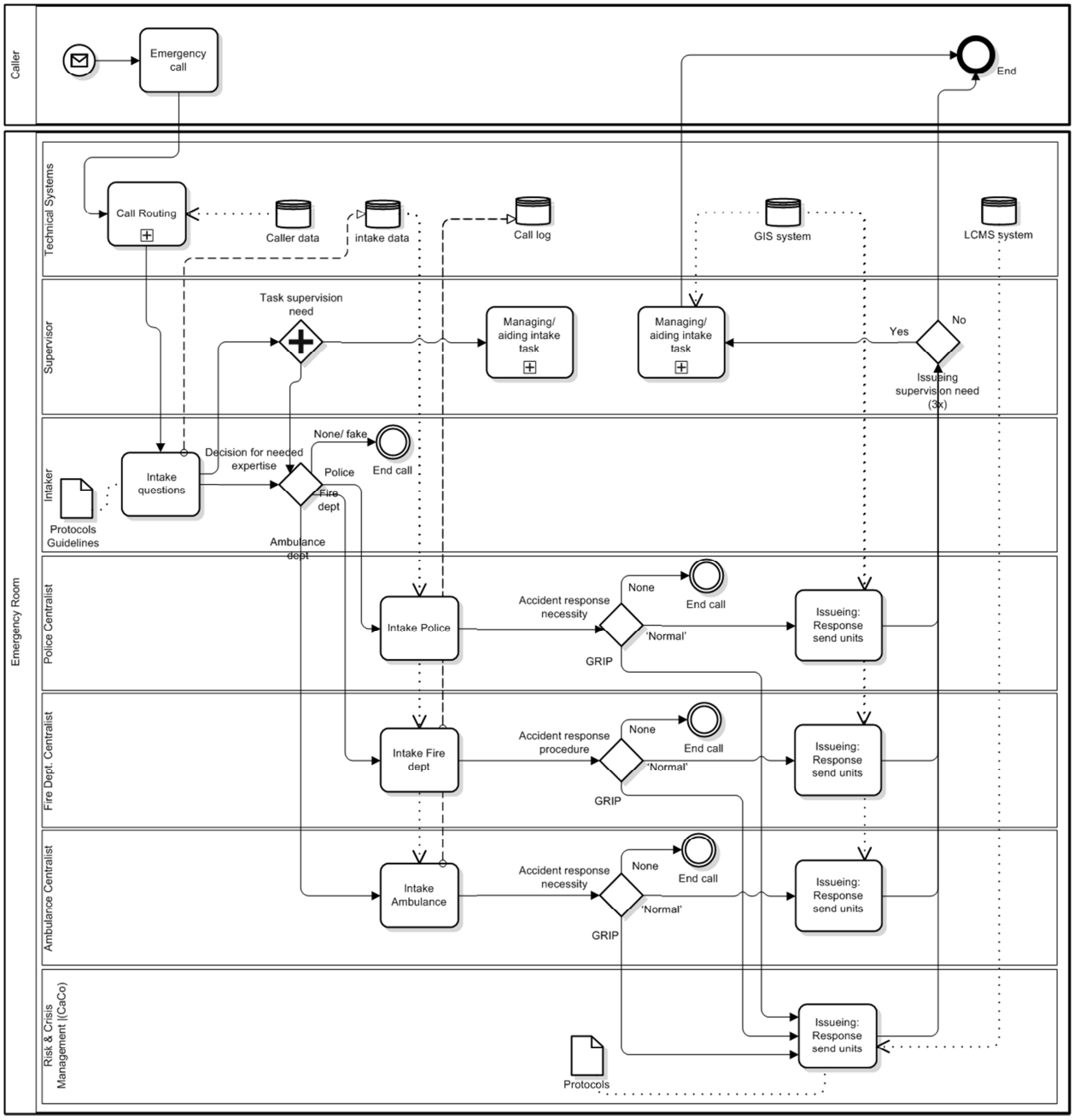


FIGURE 10 BPMN MODEL OF THE EDC EMERGENCY CALL PROCESS (IST SITUATION)

From the model the processes and responsibilities are explained**.** Within the EDC different entities are identified that are important for the (operational) emergency call intake process,

which is thoroughly described in appendix A.6. These are explained by describing the tasks that are performed. This was validated by interactions with professionals at the EDC.

Supervisor – supervises a shift of operator in the EDC

Supervision is used to oversee the whole of tasks within the EDC. This means that the supervisor amongst other things keeps track of personnel occupation. For instance when there are a lot of calls, the supervisor can assist intakers.

Intaker – first contact point

Takes the call and sets up the initial report before forwarding to a centralist. The intaker sends the call to the most knowledgeable centralist based on the request of the caller for one of the three agencies (MKP, MKA, MKB)

Centralist – call dispatching responsibility

The centralist is responsible for further questioning and for iissueing units and monitoring units on the street. There are three different centralist roles in the EDC which are the Police centralist, responsible hen police is needed, Fire dept. centralist responsible for issueing calls when fire dept. is needed and Ambulance care dept. centralist responsible when medical assistance is requested (also called specialists or operators).

Technical systems – aiding of processes

Different systems are used to improve the speed, quality and accuracy of the processes within the EDC. Systems are used for logging calls, saving and disseminating caller information throughout the EDC, classifying emergencies according to protocols which in turn automatically trigger actions. A new system is being developed that should increase uniformity and ease of use for operators. It is called NMS and will be rolled out approximately in 2018. This technology is also part of the reason that it is possible to create a more uniform service throughout Dutch EDC's

Multidisciplinary intaker – one-stop-shop operator

Responsible for helping the caller in first contact no matter which type of emergency
Operators share similarities in traits as the job descriptions of MKA, MKB and MKP operators have overlap. There are clear differences between the needed knowledge and way of working of the different agencies involved.

MKP OPERATORS VERSUS MKB OPERATORS TASK DIFFERENCE

Both are very similar. For both dispatch agencies the operators are trained on the job. Demands for new employees are only generally determined and not formalized. (Stress resistance and other personality traits that suit high distress situations are important). Selection occurs through on the job training. "if a person is not fit for the job this will become clear during the trial period."(Personal communication: police operator, 2015) The trial period consists of several months of training in which the operator becomes familiar with technical systems, protocols and different situations that occur (situations are different types of distress calls). This can take up to approximately 9 months until the operator is able to individually handle all calls. "After 9 months

an operator has pretty much experienced every type of emergency call." (Personal communication: fire dept. operator, 2015)

MKP AND MKB OPERATORS VERSUS MKA OPERATORS

A clear difference exists. The MKA operators use clear questioning protocols by law. Therefore they have much less freedom to ask questions professionally; "An ambulance operator if he does not get the required answer has to ask the same question again and again whereas a police operator can use different questions to identify the issue." (Personal communication: ambulance operator, 2015). Within the MKA selection is done based on skill standardization at the outset. MKA operators have to be certified ambulance care workers. A very different skill set required.

4.1.2 DIFFERENCES BETWEEN CURRENT AND DESIRED OPERATIONS

In this section the differences on an operational level of processes is described. To identify and explicate the current and future business operations within the EDC, process modeling is used (appendix A.6). Process models can help steer communication within the organization thereby i.a. supporting business operations, creating a framework for business metrics and referencing costs (White, 2008). The models have been developed using literature about emergency call handling in EDC's and the IST and SOLL models are validated in multiple interviews with police and ambulance care experts (appendix A.10). The complete models and explanation are found in appendix A.6

Figure 9 shows the current and desired states for the intaker tasks and process steps. The scope of this study focuses on the intake process. Considerations concerning the changes on the issuing (output, sending of units and monitoring road units) part is outside the scope of this research.

> **"We are interested to know the effect on operational level of changing the intake process, because we plan to do pilots in Q3 of 2015" (personal communication: Hartman, 15-2-2015)**

CALL INTAKE TASK CHANGES

There are two main changes identified. Figure 9 shows the current situation (IST) and future (SOLL) of call intake. There are parts that have changed and parts that are new. A new role is created and the current intake role will more or less disappear. The intaker role is taken over by a centralist (police, fire dept. or ambulance care dept.).

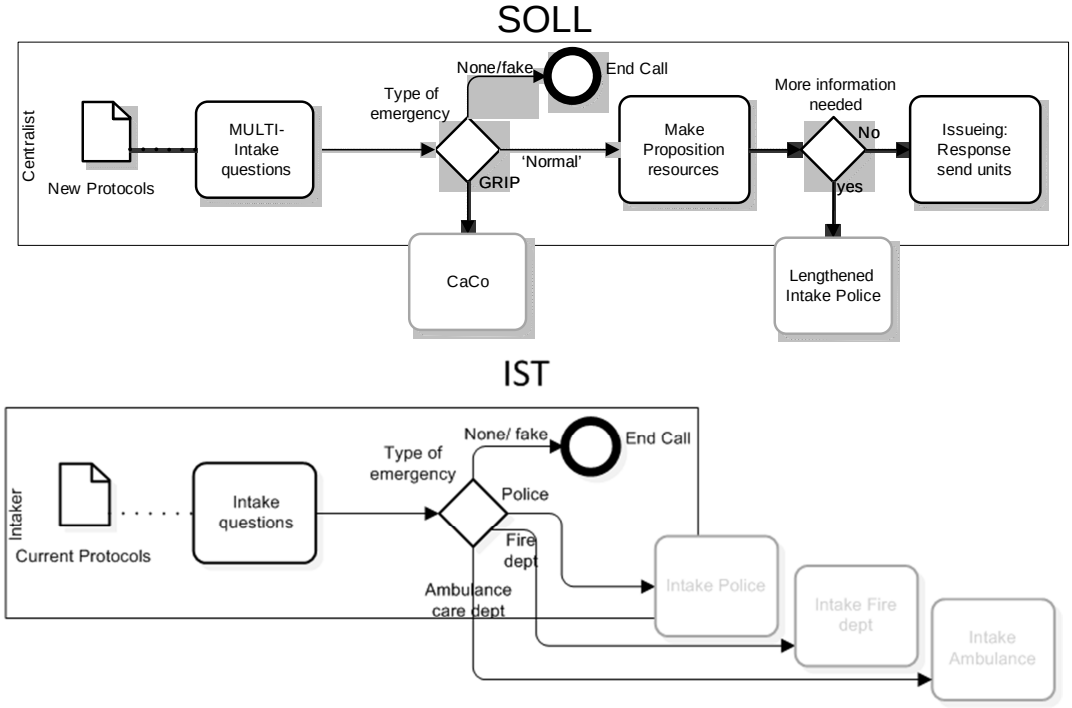


FIGURE 9 IST AND SOLL CALL INTAKE PROCESS

In the current situation (IST) the intaker uses protocols to forward calls to the specialist operator as figure 10 shows. In the desired situation the (multi-intake) centralist uses a new wide scala of protocols to help the caller in the first contact as much as possible (one-stop-shop). Their job is to determine the exact needs of the caller and act accordingly. However there are doubts about the feasibility, as argued by one of the police supervisors at the RR EDC; "I dare say that currently there is no operator in the Rotterdam-Rijnmond emergency dispatching center that is equipped to do this job" (personal communication: den Hollander, 2014). A very clear knowledge consideration thus arises.

There is a rearrangement of the pigeonholes, as an operator should be able to think with different backgrounds in mind. The different knowledge requirements for operators of MKA, MKB and MKP operators increase the difficulty to reach the desired future situation "This change means you would need a 4 year education to get schooled to become truly sufficient as a rainbow[1] centralist." (Personal communication: Den Hollander, 2014). The knowledge implication reflects directly in remuneration as well as a more knowledgeable centralist will be more expensive. From managerial perspective budget cuts are one of the goals, but this change may not lead to budget cuts due remuneration. Costs, that has been identified as possible consideration and needs to be evaluated for different scenarios. The knowledge requirement too is a consideration that centers

[1] A rainbow centralist is defined as a truly multidisciplinary centralist capable to handle all types of emergency calls.

on the question of training (costs) and knowledge need. On top of this quality is deemed harmed in a possible future scenario.

The previous paragraphs bring to light that a third option might be feasible to arrange tasks. This involves the 'rainbow' centralist and includes a one-stop-shop without backup. To evaluate this scenario information about the perceived added value of this one-stop-shop can be found in chapter 5 the scenarios are described.

CENTRALIST TASK CHANGES

Next to the intaker task a main difference is that the current centralist task will become a different one. Currently the intaker forwards a call based on preliminary judgment and questions towards one of the centralist. In case of a criminal emergency this police intake centralist is responsible for dispatching the call (figure 10).

In the desired scenario the one-stop-shop multidisciplinary intake centralist handles all calls as much as possible (figure 11). Besides this a backup system is desired from managerial perspective (appendix A.5). This backup system is called "lengthened intake" and entails that the (police) intake centralist of the current situation is still available as a specialist.

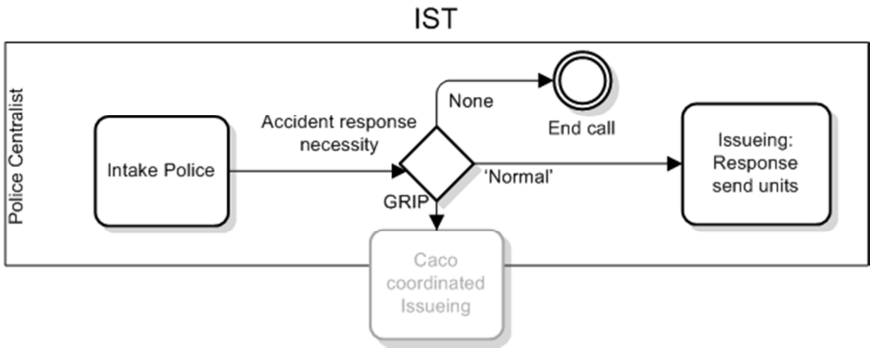


FIGURE 10 CURRENT (POLICE) CENTRALIST PROCESS AND TASKS

The reasoning form managerial perspective that MKP, MKB and MKA need less centralists for this as there is a multi-intake centralist available. Police supervisor Philip den Hollander argues that the difference on an operational level will be minimal and especially the effect on quality is very little. Mostly it will come down to having the same kind of process if the multi-intaker doesn't the answer or needs more information, the specialist has to come in through lengthened intake.

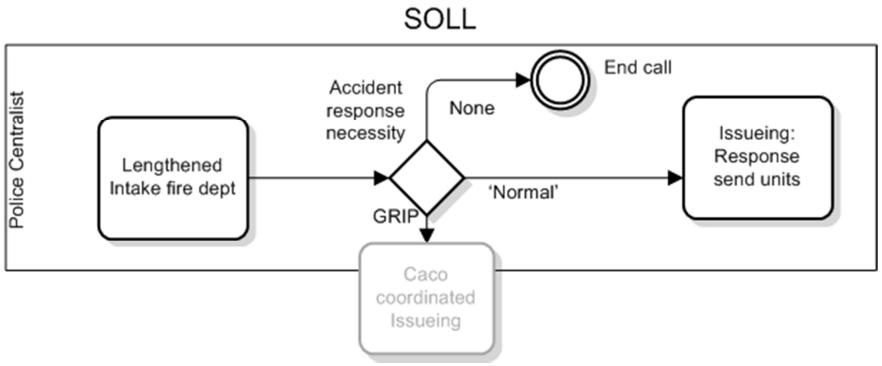


FIGURE 11 DESIRED (POLICE) CENTRALIST PROCESS AND TASKS

4.2 CONSIDERATIONS AND CRITERIA FOR TASK ARRANGEMENTS

From the analysis in chapter 3 and 4 the considerations to task arrangements that might become important were derived. Requirements posed by the government, can be considered criteria that have to be taken into account. These are depicted in appendix A.5. From a management perspective the desired situation is the Multidisciplinary intake (multi-intake) scenario. From chapter 3 it became apparent that costs,

Conclusion on the considerations that have to be evaluated

The considerations for this desired situation are that different types of considerations can be found. Together with the analysis of this chapter this has brought to light considerations that need to be evaluated. These are displayed here in a concise way. These will then be translated into criteria that can be evaluated. Must-haves and want to haves from the managerial perspective are:

- Comply with budget cuts by needing fewer operators.
- Improve the helping of caller in first contact
- Improve uniformity of caller dispatching no matter the type of emergency (better pigeonholes)
- Improve the overall quality of service through the other aspects (timeliness, reachability)
- Is supported by regulations and goals of the government to improve the emergency response services domain.

These aspects need to be considered and are important from the layer of management, however from the literature and empirical analysis it became clear that the operational layer is important to find criteria for execution.

In the literature study in chapter 2 it was described that the stability of bureaucratic structure gives inflexibility to innovation as it may affect autonomous positions of professionals. The current top-down approach has a negative impact. The operators, as professionals, should be included in the process. From the operational analysis a bias towards the current situation is expected. To find out how the goals of management can eventually be reached once more it is stressed that it is needed to take into account the operational perspective. From the operational perspective the considerations are that it should:

- Provide for a situation in which the needed knowledge question is answered. There is an effect thus of different scenarios of future situations on the required knowledge
- Ensure high quality coordination among the different agencies.
- Be feasible for operators to work with concerning technical systems, protocols and pure work substance.
- be supported by protocols, (not covered)
- Ensure high quality of service.

From the above the criteria are derived as to determine how task arrangements can be measured. Criteria should be measurable and understandable by operators. An important constraint for the criteria is that operators should understand the criteria to be able to give their opinions. This was validated with the graduation committee supervisor from the VRR to be sure the criteria would be understood.

Criteria

The criteria that are derived from the considerations that have been found in chapter 3 and 4 and been displayed in this section are:

#ONE-STOP-SHOP
#UNIFORMITY
#QUALITY OF SERVICE
#COSTS OF OPERATIONS
#KNOWLEDGE NEED
#INFORMATION SYSTEMS SUPPORT
#REGULATORY SUPPORT

In the next chapter the setup for evaluation is described.

4.3 DERIVATION OF SCENARIOS

To evaluate the criteria scenarios are derived. The current situation is the first scenario to evaluate criteria. First of all it serves as a benchmark and secondly operators can relate to it, have knowledge of it and thus can give a concise opinion on scores for criteria. The second scenario is the desired situation. This report has brought to light that differences exist in the complex political versus operational playing field. To find out if these differences exist and if problems for operational performance can be expected from the current politically-driven transition the desired situation is used as a scenario. Thirdly, as explained in chapter 4.1.2 it is logical to evaluate if a true one-stop-shop can be achieved by introducing a so-called 'rainbow centralist'. These three scenarios are ex-ante deemed feasible. Other complete scenarios have not been found during the analysis and are therefore not pursued further.

Scenario usage logic

Using three scenarios ensures that the needed time and complexity of the evaluation survey is manageable for respondents. Thus, there is a pragmatic aspect as well as clear advantages for not incorporating other (less likely) scenarios.

Three scenarios were used to evaluate the considerations. With understanding of this scenario based design can be used to develop an understanding of current activities and practices and use this as understanding for activity transformation.. The current situation should be examined as a scenario. It can thereby serve as benchmark and is easily understood by the operators. . The scenario is derived from the validated business process model as depicted in figure 10.

The future situation as intended by the government is the second scenario that is used. This is a plausible scenario and as current changes are all made to make this scenario happen it stands to reason that investigating this scenario can yield a lot of information about the opinion on the

criteria by operators. This gives insight in what the government might have done wrong, or what they should do (differently) in order to design an optimal arrangement.

The third scenario is based on the second scenario but without the lengthened intake 'backup'. It was derived as a feasible scenario by different interviews in which the author questioned why a lengthened intake should be necessary and if this might not be excluded, creating a true one-stop shop. These interviews with Hollander (2014) and Bakker (2014) concluded that it interesting to include this scenario. Den Hollander opts for a true multi-intake without backup, but questions its feasibility, while Bakker was interested in the effects it might have compared to the governmental plan.

4.4 CONCLUDING REMARKS

From this chapter the conclusion is that seven criteria can be derived that can determine the feasibility of certain task arrangements. The seven criteria are; One-stop-shop, Uniformity, Quality of service, Costs of operations, Knowledge need, information systems support and regulatory support. These will be evaluated in the next chapter with three scenarios. These three scenarios make it possible to conclude upon the importance of the criteria, the scores of different task arrangements in general and specific preference of operators towards task arrangements and the underlying motivations that define if a task arrangement is positive or negative. Relationships between criteria that might exist can also be evaluated.

5 SCENARIOS AND EVALUATION

In this chapter the analysis the scenarios are explained upon and the evaluation of these scenarios is explained. First of all the scenarios are explained and displayed. Then the evaluation concepts are described in 5.2. In 5.3 the framework for evaluation is introduced and section 5.4 explains exactly how the evaluation is done. The evaluation is based on the criteria that were derived from considerations in the previous chapter. The evaluation surveys were executed at the RR EDC. The resuls ae described in chapter 6. The sub question thereby answered in the following two chapters is:

> How are the considerations evaluated?

Descriptions of evaluation criteria is based on (Janssen & Gortmaker, 2010). Based on the analyses, it can be concluded that it is possible in different scenarios to deal with the orchestration as defined by (Janssen & Gortmaker, 2010) and the coordination of such a call within the emergency dispatch center. Section 5.1 shows the different schemes and different "offices" within the emergency dispatch center, who can be involved directly in case of the emergency call. Different possibilities arise to deal with the call. Below these scenarios are worked out. Three scenarios have come to light as being feasible based on chapter 3 and chapter 4.

5.1 SCENARIOS DEPICTION

This section depicts the three scenarios as defined in the previous chapter. This has led to three scenarios:

Scenario 1

Scenario 1 has been named **SPECIALISTIC INTAKE.** It depicts the current situation of collocated, but not very integrated emergency call handling. In section 5.1.1 it is displayed.

Scenario 2

Scenario 2 is called **MULTIDISCIPLINARY INTAKE**. The desired situation by the government for operations allocation is depicted in section 5.1.2.

Scenario 3

The third scenario is the true multi-intake scenario without backup. It has been named **ONE-STOP-SHOP INTAKE.** In section 5.1.3 it is depicted.

5.1.1 SCENARIO 1: SPECIALISTIC AID

With scenario 1 the intelligence lays in the 'back office' with most knowledgeable specialist. (As found out during evaluation, operators do not call this the 'back-office', this is a matter of terminology. Figure 12 shows the specialistic aid scenario. Dependent on type of emergency the most knowledgeable centralist will handle the call. This is the current situation (IST), worked out for operations.

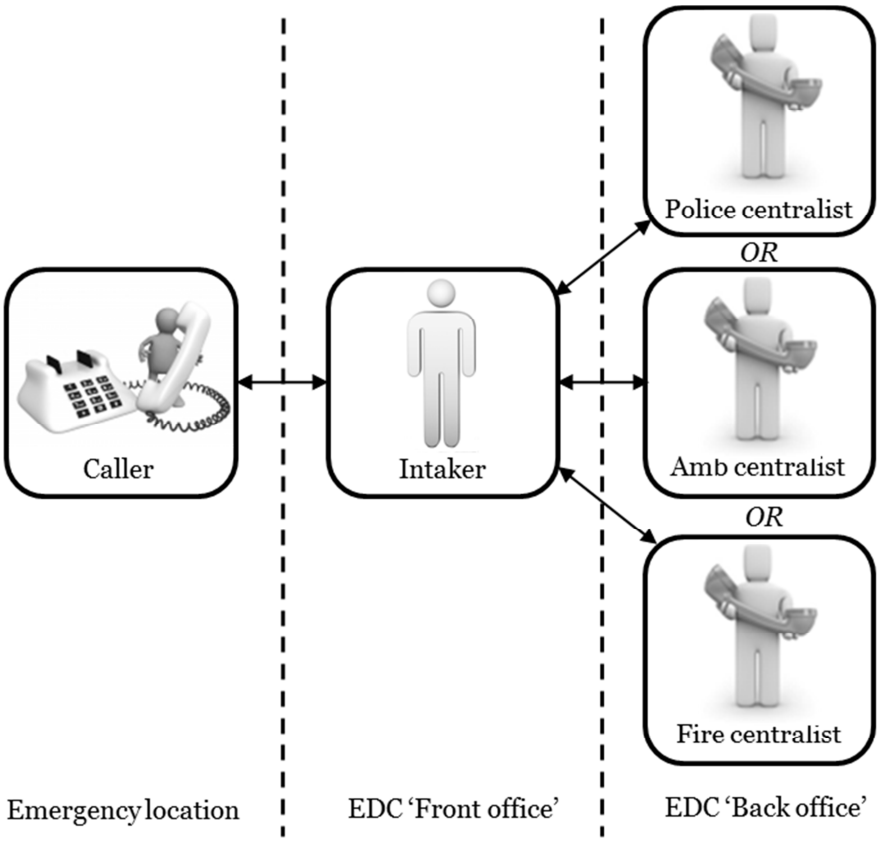


FIGURE 12 ORCHESTRATION BY MOST INVOLVED DEPARTMENT

5.1.2 SCENARIO 2: MULTI-DISCIPLINARY INTAKE

In the multi-disciplinary intake scenario, intelligence (orchestration) lies partly with centralist and partly with the back office specialist. Dependent on type of emergency and its complexity the lengthened intake can be set-up. This is the initial governmental idea (SOLL), worked out for operations and displayed in figure 13. The multi-centralist in this picture it thus the major point of contact.

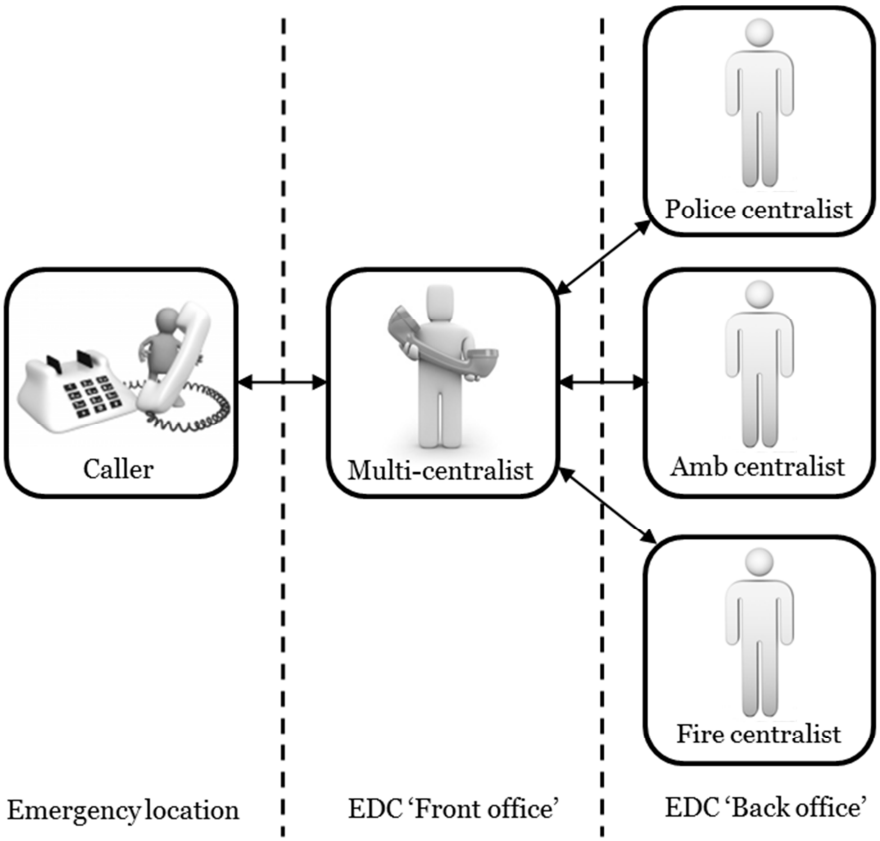


FIGURE 13 ORCHESTRATION BY MULTI-INTAKE CENTRALIST WITH LENGTHENED INTAKE

5.1.3 SCENARIO 3: ONE-STOP-SHOP INTAKE

The third scenario (figure 14) resembles the second scenario, except for a distinct difference. No backup is available. Intelligence/orchestration lies fully within hands of the multi-intake centralist. Centralist handles the call in first contact.

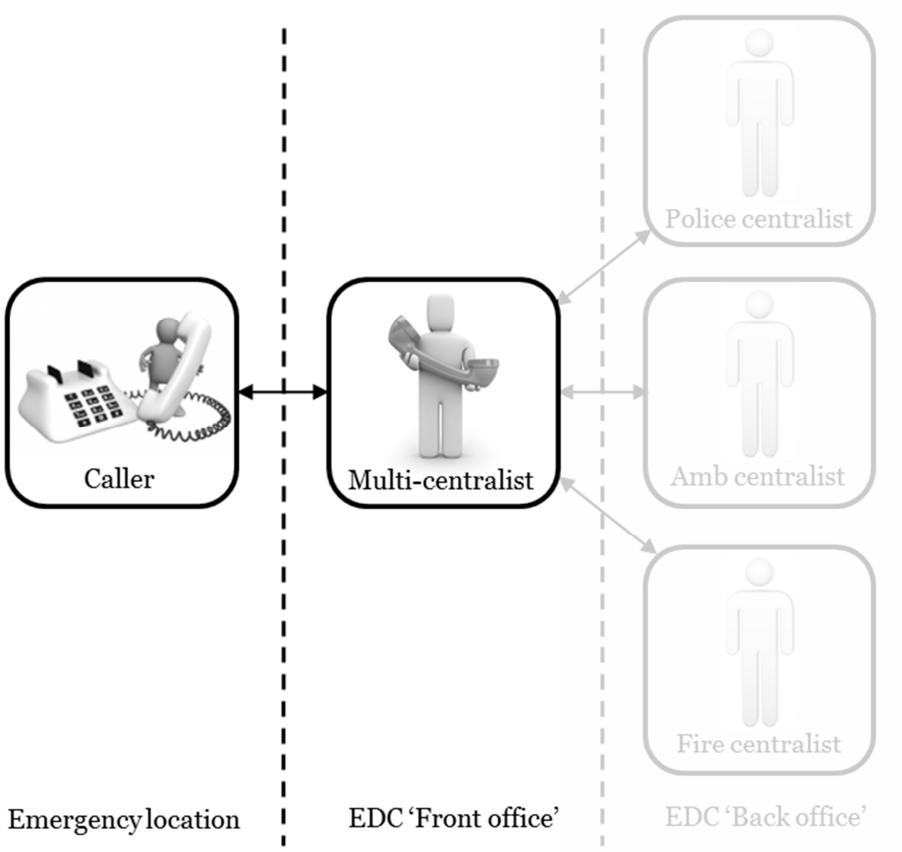


FIGURE 14 ORCHESTRATION BY MULTI-INTAKE CENTRALIST AND NO BACK-OFFICE

5.2 CONCEPTS FOR EVALUATION

The analysis brings to light different concepts that are import and that need to be evaluated. From a managerial an operational perspective there are in total 7 propositions that have been derived. The evaluation considerations that were important are first displayed again here. From the managerial perspective:

- Comply with budget cuts by needing fewer operators.
- Improve the helping of caller in first contact
- Improve uniformity of caller dispatching no matter the type of emergency (better pigeonholes)
- Improve the overall quality of service through the other aspects (timeliness, reachability)
- Is supported by regulations and goals of the government to improve the emergency response services domain.

The operational perspective handed the following:

- Provide for a situation in which the needed knowledge question is answered. There is an effect thus of different scenarios of future situations on the required knowledge
- Ensure high quality coordination among the different agencies.
- Be feasible for operators to work with concerning technical systems, protocols and pure work substance.
- be supported by protocols, (not covered)
- Ensure high quality of service.

Because of overlap only seven propositions were derived (table 3). The goal is to evaluate how the operating core values these propositions and what their underlying reasoning is to do so. With this knowledge an understanding of the change process is provided, conclusions on the feasibility of the scenarios are given and trade-offs identified. Furthermore recommendations can be done on how to manage these trade-offs.

The criteria are turned into propositions in order to evaluate their effect on the scenarios that are defined. These are used as they can be understood by operators (personal communication J. Hartman, 2015). The propositions are described in table 3 below. One proposition per criterion is used to keep the amount of questions limited and concise. This way the questionnaire can be answered in the limited time operators have.

	Proposition	Description
1	What is the influence of different scenarios on a One-stop-shop?	This criterion is meant to judge the best option for handling calls in the first contact. The derivatives of a one-stop-shop include increased clarity and speed for the caller and simplicity/clarity of orchestration

2	What is the impact on Uniformity?	It is meant the extent to which it is possible to supply a uniform service to callers (independent on the type of emergency call)
3	What is the overall impact on the Quality of service provided?	With this criteria it is meant the availability and reachability of the service for civilians, including the needed time and correctness of how the call is handled.
4	What are the consequences of scenarios for the Costs of operations?	These are the operational costs associated with the scenario, compared to other scenarios
5	Which are the impacts concerning Knowledge requirements?	The impact of scenarios on the needed knowledge and competences of operators in the emergency dispatch center.
6	What is the influence on the Support by information systems?	The amount to which each scenario can be supported by (current) information systems
7	What is the suspected impact on the Support of/by regulations in each scenario?	Evaluation of scenarios impact on regulations or vice versa (the regulations effect on the feasibility of the scenario)

TABLE 3 PROPOSITIONS AND DESCRIPTIONS OF PROPOSITIONS

5.3 CONCEPTUAL FRAMEWORK

The goal is to evaluate the propositions from table 3. The conceptual framework chosen for this is shown in figure 15. The effect of scenario on criteria is what the intended goal is, to find out the best task arrangement. The feasibility of the scenario based on the criteria can eventually be derived. To do this it is also important to understand the reasons behind the scores operators give to the criteria. In chapter 6 the results of the analyses are described resulting in an answer to the effects. To fill in the framework however interpretation is needed based on the synthesis of results and previous analysis. Therefore conclusion on the model will be given in in chapter 7.

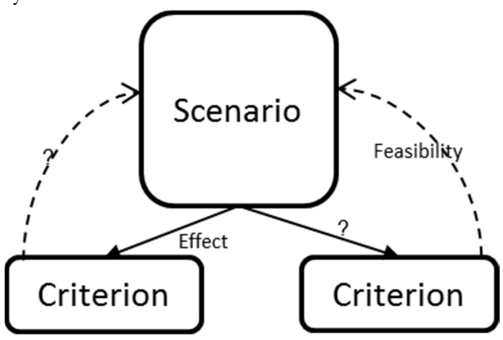


FIGURE 15 CONCEPTUAL EVALUATION MODEL

5.4 EVALUATION METHOD

To evaluate the propositions on operational level interviews and questionnaires are used. In this part the interview composition is discussed. First of all the method is described. Then the respondents are discussed and the interview itself. The first goal of the evaluation is to find out the extent in which changes towards a new desired (SOLL) situation may be achieved. Secondly; to find out which scenario has best fit according to employees, and whether there is a difference in opinions between management and operational layers that should be taken into account. A survey is set up to find opinions and validate on possible future scenarios for the EDC operational role division. The operational level has been chosen for this. The different opinions about the propositions for different respondents can furthermore be compared to find out if there are tensions in that respect between different operators.

5.4.1 RELEVANCE OF EVALUATION INTERVIEWS

The interviewing is relevant to understand the effect of different scenarios on the propositions. It is thus for evaluation purposes.

- Operator perspective on criteria has not yet been examined
- Relevant notions on why criteria are important for operators come to light
- Trade-offs for the management in terms of taking into account the important criteria from operational perspective

5.4.2 RESPONDENTS

For the survey it is important that parties involved in the primary processes are questioned. The research problem to investigate was the operational roles and the yet uninvestigated operational perspective in the complex policy environment. In the problem description it was talked about the fact that there are different ways to manage tasks in order to achieve a common goal. It is unknown in general how to shape new roles, if and how to change the task arrangements of different agencies involved which differences that are expected between the decision making layer (politics/government) and executing layer (operational agencies at EDC) turn out to be true. Thence the choice to interview the operational roles was made and this will give insight in opinions and consequences about the changes proposed and different scenarios designed. The survey will question the four roles directly involved in operations at the Emergency Dispatch Center (These roles are explained in chapter 4.3.2.):

Intaker

The intaker's job is intended to be disappearing. Questions about their opinion about this and about their task gives insight in their preference to the future of the EDC task allocation.

Centralist police

The centralist in different scenarios will have different kind of responsibility. The question is which type of role the centralist sees for him- or herself and the effects they perceive from their

professional opinion.

Centralist fire dept.
See above (police).

Centralist ambulance care dept.
See above (police).

Furthermore a supervisor is questioned:

Supervisor
The supervisor task description can be different in different circumstances. As a supervisor has a good overview of what happens amongst the different other roles within the EDC the supervisor can answer questions with this broader view in mind.

There are four goals that made decide for these respondents:

1. To get an overall idea of the considerations/effect of the scenarios on the criteria and why they have an effect according to operators.
2. Find out if there are different evaluations of criteria importance
3. The third goal is to find if opinions within and between roles at the EDC of RR differ or if they are similar.
4. Identifying the best arrangement according to operators.

NUMBER OF RESPONDENTS
In total per role one or more employees are interviewed which brings it to a total of 13 interviewees of which 12 entered the questionnaire. Three intakers, two MKP centralists, three MKA centralists three MKB centralists and a supervisor were interviewed. Usually per shift one or two supervisors are present. During the interviewing day one supervisor was able to be interviewed due to working circumstances (an unexpected regional KPN telephone line failure). This is to be reminded when interpreting results.

5.4.3 INTERVIEWING METHOD
The subject of study is a single case. I do not want to call the interview a case study, but it can be guarded as a single-case design study (Yin, 2008). Yin defines three types of studies being exploratory, descriptive and explanatory. This research is exploratory, as outcomes are not finite, but descriptive insights can be obtained as well from the propositions such as differences between respondent groups. Therefore closed questions are designed. Miles and Huberman (Miles et al., 2014) call this *multimethod design*. *Means* can be compared between different groups and on the other hand qualitative coding can be used to describe reasoning for this. The qualitative explorative nature of this study is described in chapter 1. The questionnaire consists of

thirty-one questions of which three general questions. The scale used is a 5-point likert scale as it is the most common format and its intuitive nature makes it easy to fill in. See appendix A.12 for the questionnaire and scales. In appendix A.11 the interviewing execution format is explained in detail.

INTERVIEWING QUESTIONS

The main questions from the questionnaire are based on the criteria from section 4.2 and propositions derived to evaluate them. For each of the three scenarios the following seven propositions are questioned:

P1. What is the influence on the criterion one-stop-shop
P2. What is the influence on the criterion uniformity?
P3. What is the influence on the criterion quality of service?
P4. What is the influence on the criterion costs?
P5. What is the influence on the criteria needed expertise (knowledge) and competencies?
P6. What is the influence on the criterion support of information systems?
P7. What is the influence on the criterion support for/by regulations?

5.5 CONCLUDING REMARKS

This chapter has explained the set-up for evaluation of the considerations that were identified. The question was;

> How are the considerations evaluated?

The considerations are evaluated using the criteria that are set up at the end of chapter 4. The criteria will be questioned using seven propositions. These propositions will be scored by the three different operator roles at the RR EDC. The three alternative task arrangements that are described in this chapter will be evaluated which will eventually give insight in the way operators perceive the importance of different considerations. The scores will reveal if there are differences between task arrangements and which underlying reasons there are for this. The question marks from figure 16 in section 5.3 will be answered in the next chapter the results of the evaluation survey and accompanying interviews are described. In chapter 7 these results are interpreted.

6 RESULTS

To find out what the general opinion is within the operational force of the Rotterdam-Rijnmond Emergency Dispatch Center the three scenarios are evaluated. In this part the results of the questionnaire and accompanying interviews are displayed. In order of first a quantitative and then qualitative results this chapter presents the outcomes of the eveluations. After this results can be interpreted and discussed. In this chapter the goal is to give an objective representation of results which will be interpreted in chapter 7. The question for this chapter is:

> Which task arrangement can be considered optimal?

This question is answered in the following chapter by investigating the opinions of the operating core on the scenarios.

6.1 ANALYSIS REASONING FOR METHOD

The results from the quantitative part (scoring of scenarios on the 7 criteria) are analyzed by means of establishing average scores of the operational roles. Also diffeences are analyzed using averages. Because of the limited amount of respondents (12) no in-depth statistical methods are used. The results are analyze to establish the following results

- per criterion average scores to find out which criteria are most and least important
- group averages per operator role to investigate similarities / differences.
- Scores of operators versus supervisor role to see if these are very similar or different.

As explained in section5.5.3 the multimethod by Miles and Huberman (Miles et al., 2014) is used. They propose to use averages to analyze the differences and similarities between groups. The qualitative answers accompanying the scores thereby give insight in the reasoning. This reasoning is of great value for interpretation of the scores. Without it the scores are difficult to interpret. Both combined give room to identify the operational consequences of different scenarios on the evaluation criteria and is used to conclude on considerations for task arrangement design.

6.2 QUANTITATIVE SURVEY RESULTS

The results will be presented as follows. First of all the questionnaire results are discussed. The scores and weights that the respondents have given are presented. The scores given on the 5-point likert scale are quantized to calculate averages. This leads to an overall view of scores per scenario. After this the differences between operator groups are discussed. Throughout this chapter also the coding of qualitative answers given during the interviews are described. Scores are rounded to one decimal.

6.2.1 WEIGHTS

In this section the weights given to criteria are discussed. These give an idea of the importance given by the respondents to the different criteria. The criteria are scored based on importance relative to each other. This means the scores are not to be interpreted as absolute values.

From figure 16 observations can be made concerning the criteria importance. In general the criteria that score higher then 3 (neutral) are generally considered important. The Quality of service is considered as the most important criterion. The effect on quality of service of scenarios is thus the most important consideration. Furthermore the effect of needed knowledge is reinforced by high importance given. The costs score 2,4 on average and from the operational layer are considered the least important. There is a point difference between the next criteria of uniformity and regulation support (3,6 avg. score). Information systems support is ranked third most important. The impact on a one-stop-shop is ranked fourth with uniformity and regulation closely following and considered equally important.

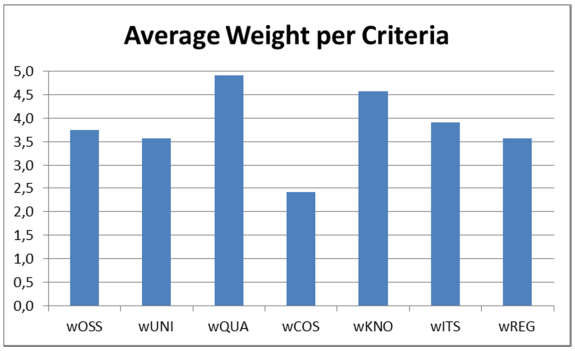


FIGURE 16 ASSIGNED WEIGHTS BY RESPONDENTS

The average total weights given say something about total importance, but differences and similarities between groups are also observed (see appendix A.13). In general looking at the assigned weights most operators assign similar weights to the criteria, meaning they all value the same things as important or not. This said there are three variation observed. Apparently MKA centralists regard information system support as much less important as other roles do. Furthermore MKP centralists assign much higher weights to uniformity and one-stop-shop.

6.2.2 SCORES OF SCENARIOS

In this section, the scenario scores are presented as cumulative averages of all operator scores on criteria. Figure 17 shows the overall average scores by the four operational roles on the questions.

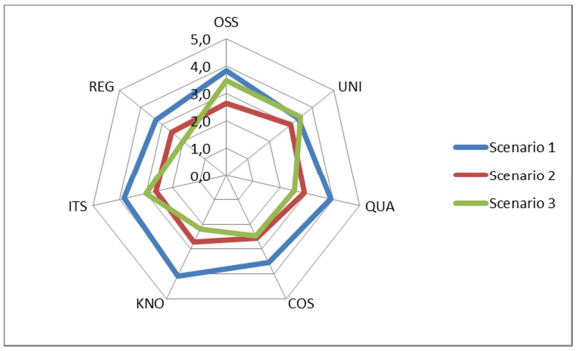
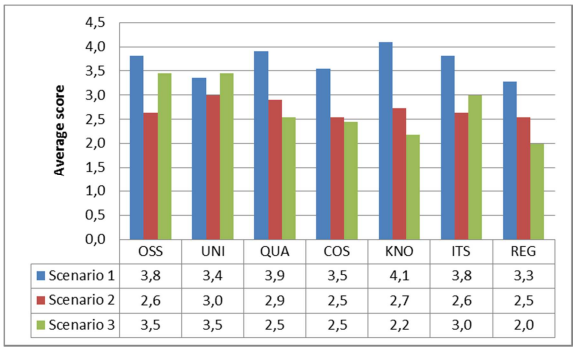


FIGURE 17 PLOT OF OVERALL AVERAGE SCORES OF SCENARIOS



	OSS	UNI	QUA	COS	KNO	ITS	REG
Scenario 1	3,8	3,4	3,9	3,5	4,1	3,8	3,3
Scenario 2	2,6	3,0	2,9	2,5	2,7	2,6	2,5
Scenario 3	3,5	3,5	2,5	2,5	2,2	3,0	2,0

FIGURE 18 SCORES OF SCENARIOS PER CRITERION

None of the scenarios scores perfect on each of the criteria. Scenario 1 scores a 3.3 on the 5-point likert scale the or higher overall which means that in general people or neutral to positive about the current situation (average score 3.7). Scenario 2 scores an average of 2.7, meaning it is considered neutral to slightly negative on criteria combined. Scenario 3 also scores a 2.7 on average.

Scenario 1 is preferred on each of the criteria compared to scenario 2. An overall trend towards keeping the current situation is visible. There is a clear preference towards current arrangements in comparison with changes concerning effect on quality of service which is ranked highest in the current situation and moreover is ranked as very positive in general. Also a one-stop-shop is best preserved under current conditions. A multi-intake arrangement without backup also has a positive effect on the one-stop-shop proposition. . In comparison with scenario 3 scenario 1 scores better on most criteria except for the impact on uniformity, which scores better in scenario 3, which is considered fairly positive for scenario 3. Knowledge need is however negatively influenced under scenario 3 as is regulatory impact. Information support is considered positively influenced by the current condition while scenario 3 scores average compared to scenario 2. All three scenarios score relatively negative on regulatory impact.

Observing the different criteria scores in general the least high scoring criterion is that of regulation which in general scores neutral to negative (average score 2.6). This is logical as interviews suggested regulatory boundaries as issues.

6.2.3 SCORE DIFFERENCES BETWEEN GROUPS

In this part the differences between scores of operator groups for the different scenarios are given. The figures 21, 22, 23 and 24 show the scoring per group for the scenarios on all criteria. To display the differences on total scores between different operational roles at the emergency dispatch center it is looked at figure 19. The figures represent the (average) scoring on the vertical axes, which is not displayed in the figures themselves.

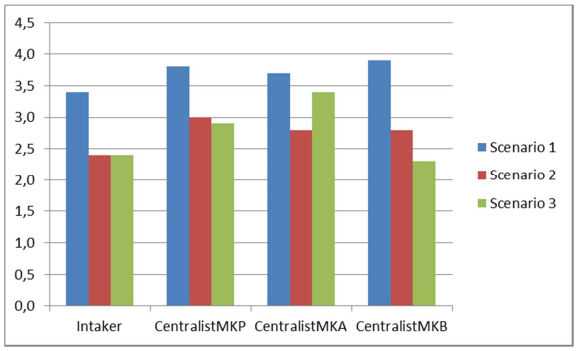


FIGURE 19 SCENARIO SCORES PER OPERATIONAL ROLE

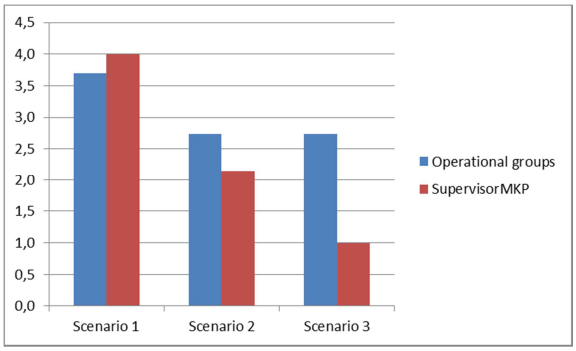


FIGURE 20 OPERATOR VERSUS SUPERVISOR SCORING OF SCENARIOS

Overall every group chooses Scenario 1, the current situation as most desirable based on the criteria. MKA Centralists however are more positive of the third scenario in comparison to the other operational roles and supervisor. Also intakers are least positive about the desired situation by the government. In general the operators are neutral to negative concerning scenario 2 and 3, while being positive about the current situation.

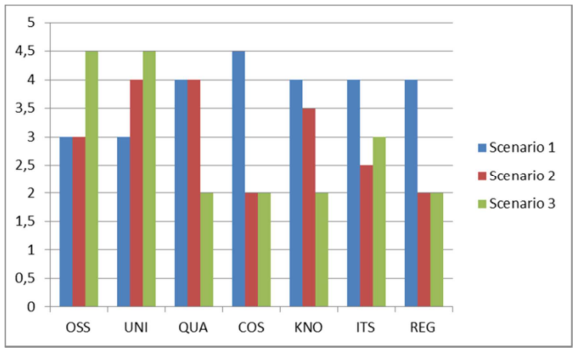


FIGURE 21 MKP SCENARIO SCORES

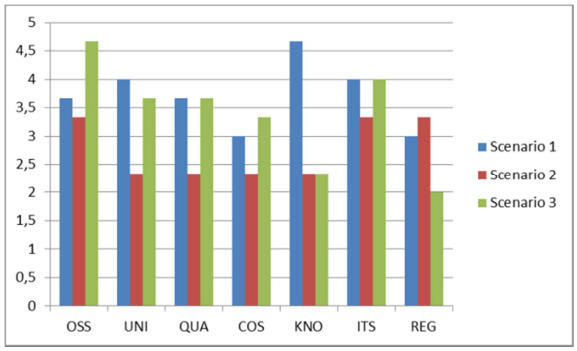


FIGURE 22 MKA SCENARIO SCORES

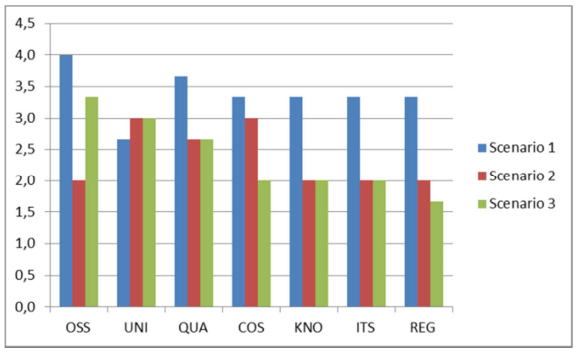


FIGURE 23 INTAKER SCENARIO SCORES

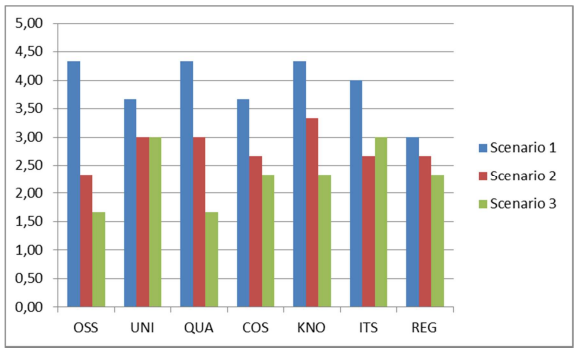


FIGURE 24 MKB SCENARIO SCORES

Concerning the new possible situations there are more clear differences. MKA centralists judge scenario 3 more positively then scenario, whereas the others do not. Figure 20 shows if there are differences between operational roles and the supervisor concerning different scenarios. Most noticeable is that according to the operational groups scenario 3 has a less negative influence on criteria then according to supervisor.

The differences are refined by showing the 'per criteria' scores on scenarios for the different groups in figure 40 to A.13. MKP centralists are positive about the influence of multi-intake on uniformity and on-stop-shop. The latter also goes for MKA centralists. The figures show that MKB centralists are more negative about effects of multi-intake scenario influence on a one stop shop compared to other groups, thereby lowering the overall outcome. Without this, one-stop-shop would have been considered best influenced by scenario 3. This seems logical as it would suggest a single point-of-contact. MKB centralists disagree however. Only MKA centralists see a (more) positive influence on regulatory support for multi-intake with backup (scenario 2), whereas other respondents (clearly) are more positive about the current situation concerning regulatory impact. Concerning information support MKA is also predominantly positive for all scenarios. They also think that it is not a very important criterion (see figure 40 appendix A.13 weights per criterion per group.

6.3 QUALITATIVE SURVEY RESULTS

Insights in the reasoning behind the scores given by the operational workers are depicted in this part. The most important results of qualitative answers from the evaluation surveys are displayed. It helps identify the most prominent possibilities and bottlenecks for typical task arrangements. The extensive results are noted in appendix 12. The results are grouped per operational role. As noted at the quantitative answers, the interpretation is done in chapter 7.

Intaker

The scores given by intakers conclude that quality of service and one-stop shop are the most important according to them. Scenario 3 and scenario 1 are similar for this last proposition, however for the other criteria scenario 1 clearly scores more positively.

> **"callers are more used to the current situation."**
> **(Interview: intaker, 2015)**

The current situation is preferred but not seen as optimal in terms of collaboration; *we have a glass wall between the organizations meaning a lack of collaboration.* In Multi-intake it is argued that a shared (online) notepad can be used to exchange information. This is not allowed momentarily due to regulations. This means scenario 2 and scenario 3 are only viable if everything is judicially covered, which is difficult in their opinion. Protocols are needed in scenario 2 and 3 as not all specialisms can be learned in-depth. Without back-up it becomes an ever bigger issue. Furthermore you lose oversight. Protocols reduce quality. Protocols don't work when someone is

panicking. Using protocols is only viable at higher costs. With ProQA the amount of high priority drives has increased 40%. Just because of the protocol Controlling instances evaluate MKA centralists based on following protocols. If less than 96% is followed they get penalty points. You can lose your ability/skill in the new situation(s) as you do not encounter as much of one specialism as you did before. Lastly fear is that they will likely lose their job.

Centralist Police (MKP)

Especially concerning uniformity, quality and knowledge they are in general positive towards the new situation as desired (Scenario 2), fig.21. Scenario three scores high on one-stop-shop and uniformity, neutral on it support but low on other criteria which makes it less preferred in general fig 21. As said the one-stop shop is preferred because with multi-intake you can help everyone in one go.

It is explicated that educating operators should be manageable however if no backup is available the quality will suffer because the knowledge level of current specialists is not reached. Cost increases are foreseen because the need for more qualified personnel to handle multi intake.

In terms of regulations it is clear that scenario 2 and three aren't favored. The reasoning is that it is not self-evident that changes in rules, which are deemed necessary, will work out.

> **"If you are able to change regulations then I think the two new scenarios are both viable." (Interview: police centralist, 2015)**

Furthermore information systems in terms of hardware are already outdated and there is little faith in budget for better information support let alone the amount of integration necessary for multi-intake.

Uniformity, lastly, can increase in scenario 2 compared to scenario 1 because tasks are performed by well trained personnel in all three disciplines. A more overall view is needed though. Scenario three is even better as a multi-intaker should be equipped to handle a call from front to back. There are however boundaries seen to make this happen (e.g. education and it-support).

Centralist Ambulance (MKA)

In general MKA centralists were most positive of the current situation (scenario 1. The quality of service is that will be established will be less due to reachability issues in a new situation. Also very importantly they describe the fear of regulation changes needed. Especially losing their BIG registration and making their profession obsolete are fears.

The usage of proQA currently is seen as helpful but they think without it they can do as good a job. Scenario 3 would be preferred over scenario 2 if it is feasible. Scenario 2 is 'just half a measure' not increasing efficiency and uniformity compared to this. They see the one-stop-shop,

uniformity and quality as very positive for scenario 3. A very high score on one-stop-shop is given to scenario 3 (see figure 22) which is argued by a MKA centralist;

> **"The new situation is a better one-stop-shop as now if an intaker makes an error or the wrong centralist is involved, the whole process has to start over."**
> **(Interview: ambulance centralist, 2015)**

Using a lot of rules you can glue the system as such shut in terms of when to send units or not, but it decreases the quality, as professional opinions matter; 'I need my professional experience to judge the situation in-depth' (interview: ambulance centralist, 2015).

Centralist Fire department (MKB)

In general the MKB centralists are inclined to find scenario 1 a positive scenario concerning most propositions. They are fairly negative towards effects of criteria on the other scenarios. Most important considerations are described below.

First of all a true multi-intaker would be a good one-stop shop according to MKB centralists, however their scoring and answers suggest they do not think it is feasible because of knowledge requirements. Moreover regulatory boundaries are seen as an inhibitor for arranging the work like in scenario 2 or 3. First of all the education need and BIG registration for MKA centralists are clear bottlenecks in their opinion. The ProQA protocol for ambulance now is far from perfect. So professionalism needed.

In a new arrangement, especially without backup, the knowledge requirement becomes too high. Changing knowledge requirements is thus needed. A model where protocols are used would solve this requirement according to them and would improve uniformity. The institutional setup of MKA versus MKB and MKP is a consideration that came to light. As MKA has to do with private health care insurance companies with different interests in costs cutting and efficiency this can be an issue for centralization. Lastly, concerning it systems current emergency classification systems aren't viable and should be changed to be able to work with as multi-intaker.

Supervisor

One supervisor was questioned during the evaluation session and some interesting views came to light here as well. The new situation is not going to be able to qualitatively match with the current situation. As specialization disappears and makes place for more holistic multi-intake you can't get around the usage of protocols, which in the opinion of supervisor does not necessarily increase (but decrease) overall quality. The protocol usage also has an influence on the needed knowledge for task execution and has to match with our (current) information systems, which isn't supported (yet). Privacy laws concerning medical data make multi-intake difficult to implement. There is a tension between police fire and ambulance department as to the information that is needed versus the information that you are allowed to share for collaboration.

6.4 CONCLUDING REMARKS

The question for this chapter was:

> Which task arrangement can be considered optimal?

The survey interview multi-method proved very helpful in comparing the scenarios. The questionnaire results display bottlenecks and opportunities for different task arrangements while the interviews accompanying the questionnaire gave new insights into considerations to take into account and further investigate. In this section the conclusions of the quantitative and qualitative results of the chapter are displayed. The presented results give a good overview of the effects of scenarios on the seven criteria. Here the most important findings are described. The feasibility of the scenarios will be described in the interpretation chapter.

The results of the questionnaire show that the operators at the EDC have a preference towards the current situation (1). The current task arrangement scores high on the seven criteria compared to scenario 2 and 3. This means operators do not think that the desired situation wanted by the government, nor the complete multi-intake scenario (3) are an improvement on the criteria. Scenario 1 scores above average (3.7) while scenario 2 and 3 are tied overall with average scores of 2.7 on a scale of 1-5.

From the interviews it becomes clear that a lot depends on the choices that are yet to be made concerning the new situation. These choices concern judicial and criminal law, education and protocolling. These have an influence on the way criteria are judged and this in turn determines the viability of scenarios. Changes in regulation are deemed necessary, but attributed as well as a difficult to manage change. Judicial (e.g. private medical data) and criminal laws that currently prohibit information sharing also inhibit thereby collaboration and decrease the viability of creating a qualitatively high service level in a multi-intake environment. Combining the interview and questionnaire results it can be concluded that current task arrangements aren't perfect, however the feasibility of a new arrangement made respondents give lower points to the other scenarios.

Surprisingly so, a lot of the expected and intended benefits stated by the government, which have been the justification for the new organizational and task structure, do not seem to be seen as such by the operating core. Concerning one-stop-shop for example, where the hypotheses that multi-intake leads to less contacts for callers does not seem to be true. This needs further investigation and interpretation. Only on uniformity one of the new scenarios (3) is observed as more positive, because collaboration between departments is currently found to be limited, however this criterion is ranked 5th in terms of importance compared to the other criteria.

Another conclusion is that protocols (which are seen as part of the information system support criterion) have a lot of influence on the way of working which can have a large impact within the different scenarios. The ProQA protocol is seen as a good aid, as well as it can be an impeder of professionalism and thereby quality. Furthermore protocols are seen as never perfect for every

emergency call. This can be a trade-off and is to be further examined. The introduction of multi-intake can't be seen without the introduction of more protocols because the knowledge need criterion becomes too complex to just combine the tasks of the three disciplines. This knowledge need is coupled to training need of which different opinions exist. Among this most importantly the amount of training needed, the viability of reaching a sufficient professional skill level and keeping this skill level and the feasibility for current personnel's ability to become skilled. Furthermore information systems need to change to support protocolling in multi-intake.

Among operational groups there is more or less consensus about the importance of the propositions. Quality of service is, logically, considered most important. Apparently the quality of service is a primary criterion, or can be seen more as a goal. Other criteria are coupled to quality and operators base their opinions on the other criteria in relation to the level of quality they think that will result from it. All of the operational groups prefer scenario 1 as the best task arrangement. Except for overall consensus differences are also observed. TO give an example, some operators of MKA and MKP think '*MKB centralists could help us do our tasks, as they get only limited amount of calls'*, however from MKB centralist perspective, when only two centralists are present which often happens, they see this as impossible in the current situation.

Seemingly, more relationships exist between and within criteria that determine the feasibility of the future scenarios compared to the current situation. The consequences of this and other conclusions will be examined in chapter 7. The findings in this section can be related to the different theories investigated earlier. Protocols relate to a pigeon holing classification process. Regulatory choices are part of the way the organizations are steered. Organizational pulls can be related to the trade-off between protocols and professionalism and the preference for scenarios in general. This might magnify the bias towards the current situation (1). Also pulls between operator groups for information sharing and collaboration can be identified. Under the presumption that new protocols will be introduced to standardize the output one of the respondents described the desired situation (2) as *'assembly line work'*. This can be related to the overall organizational structural arrangements (hybrid) that were identified in chapter 2.

In the next chapter these relations are interpreted further, the evaluation framework is filled in and conclusions are generated as to which is the best/most feasible task arrangement and which further trade-offs can be made.

7 INTERPRETATION AND DISCUSSION

The previous chapter was meant to objectively present the results of the evaluation surveys concerning the best task arrangement and accompanying considerations. Conclusion is that the current situation is best considered by the operational core. In this chapter the results are interpreted and combined with the analysis done. The results will be put into perspective. Using the conceptual framework set up in chapter 5.3 the results will first be analyzed in section 7.1. . In chapter 7.2 and 7.3 the views on scenarios and criteria are discussed .In chapter 7.4 conclusions to the evaluation survey results are described. Finally in chapter 8 the evaluation is coupled to the previous analyses to come to conclusions.

7.1 MODEL RESULTS

The results displayed in chapter 6 are analyzed and the criteria, their relations to the scenarios and the evaluation framework are investigated. The initial model first is displayed again. In this section the model is interpreted and adapted where needed.

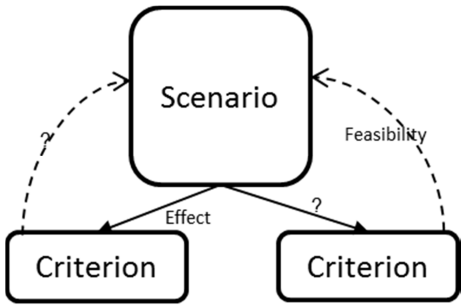


FIGURE 25 ORIGINAL EVALUATION MODEL

7.1.1 FOUND INDICATORS AND CRITERIA RELATIONSHIPS

From the evaluation survey results the conclusion can be derived that the current task arrangement at the EDC is the best compared to the other two scenarios. This was expected, however it is interesting still to see which dynamics play a role. This leads to more insight in which considerations should be made and which policy choices are applicable.

The results show several indicators that say something about the criteria. They show that the amount of protocols is an important indicator for task content and that they influence the needed expertise. More protocols lead to less expertise needed. On the other hand there is a balancing factor as there is an "unknown" optimum of amount of protocols to create the highest quality emergency dispatching. In this sense it can be concluded that protocols can improve quality, but there is no consensus as to the way this should be implemented. Protocols can be imposed by the government or self-imposed if they are within regulatory boundaries. If not, these regulations

need to be changed. Therefore regulatory change and the feasibility thereof are important. Protocols are executed with help of information systems.

This means that more protocols lead to more changes in regulation, or less support by (current) regulations. Especially in multi-intake one or more protocols have to work together to aid operators in their tasks, requiring a well-functioning backend. On top of this more protocols will lead to more needed road units.

For task arrangement increasing the helping of callers in the first contact (one-stop-shop) the indicator found is the amount of times an answer is unknown, like the amount of times that a call is forwarded wrongly. In the current situation the one-stop-shop is considered best, which is surprising, because of the intaker role which should be removed in one of the other situations. The reason for this is that the amount of errors increases due to higher knowledge need, so that it is more difficult to answer correctly.

Information sharing laws are regulatory boundaries that influence the collaboration accepted. The rules concerning privacy thus indicate regulatory support. Registration law is an example; BIG registration that is obliged for MKA centralists. Regulation-wise the amount of regulations can be decreased to improve possibilities to create shared protocols in order to decrease the knowledge need. On the other hand it is possible to increase the standards of skills (e.g. only personnel with a higher vocational education). This decreases the training need, but increases costs. Less demand for knowledge leads to less quality however, which is considered the most important criterion for examining scenario feasibility. Knowledge demand and knowledge need are two different concepts that have to be matched. The knowledge available is a boundary for the desired situation of multi-intake (2), but more so even for the scenario without backup (3). Related to this the determined indicator of training, or education, of operational employees influences the knowledge available and the amount of training in turn is dependent on the protocolling and quality level that is desirable. This also influences costs, which is not seen as an important criterion from operational perspective, however does influence choices on the organizational level.

7.1.2 REVISED MODEL

The conclusions above lead to more knowledge about the criteria (indicators), the way they affect each other and the feasibility of the scenarios. The criteria that define the feasibility of these scenarios contain more complexity than the evaluation model suggests. This insight makes for changes in the original evaluation model. The new model in figure 41 shows that criteria influence each other. Furthermore indicators like protocols relate to- and define the criteria. Some of the effects among indicators and criteria are directly or indirectly causal, others appear to be trade-offs. The causal relations are depicted in A.14.

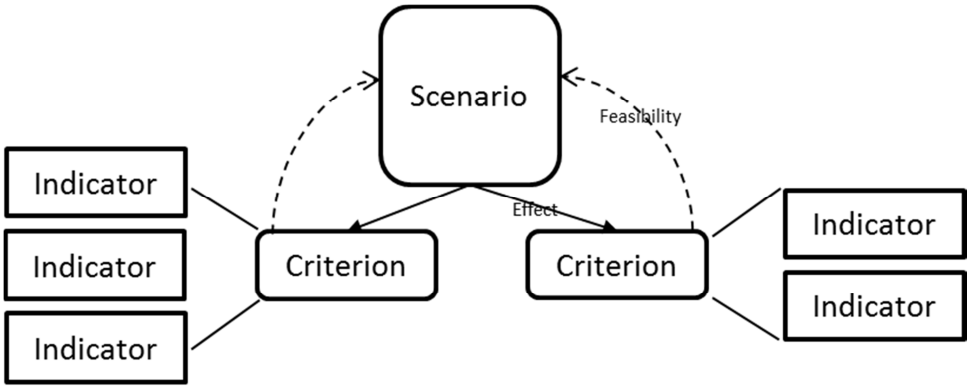


FIGURE 26 REVISED EVALUATION MODEL

With the knowledge of how criteria are related and how they influence the feasibility of scenarios conclusions now the differences between the findings and what the government expected will be investigated.

7.2 DISCUSSIONS ON RESULTS

7.2.1 INTERPRETATION OF OPERATIONAL VIEWS ON SCENARIOS AND CRITERIA

Systems engineering describes views and viewpoints to identify systems. It can be used in this case to identify why certain aspects are seen or not seen by an actor group. From the actor group of operators the viewpoint of operators is on the output they can offer callers based on their experience and training. The output is defined by them as the quality of the service they can deliver. From this viewpoint they view every other criterion, whether it has a positive or negative effect on the quality. Within the different operational groups viewpoints differ as different background lead to different ways of viewing the system. Apparently these views do not have an effect on the eventual outcome of scenarios.

There is a bias towards the current situation, which can be expected based on for example fears for job loss. Also the fact that there are still a lot of uncertainties about the effects of changes improves this bias. The perspective taken influences the outcomes.

Operators interpret the criteria differently than expected based on the initial model. First of all as discussed in chapter 6.3 (results conclusion), the operational core sees quality as a primary criterion and other criteria judged based on their direct or indirect impact on this quality.

Within the operational core differences are also seen. Some are difficult to generalize, but some also can be linked to the type of job. It was observed that one of the MKB centralist thought that multi-intake feasibility is not decreased by the fact that more knowledge is needed. This can be explained by the fact that MKB centralists may have another view than other disciplines. They

have of the three disciplines the least "wide" scope of problems to deal with, or said better; problems can be easier categorized compared to for instance diseases which the MKA operators deal with. .Also because there is no resource scarcity present on the road, MKB operators can more easily chose to send units to a scene.

The supervisor role seems in general most negative about changing the current situation. This negativity can be attributed to the fact that the information support is not available. The supervisor is more anxious in comparison to operators towards integrating these systems as he/she can oversee its complexity better and therefore sees more boundaries. The same goes for changes in laws and regulations, which are seen as mayor boundary by a supervisor.

Though consensus overall about the best scenario is present, concerning different criteria different values are given. This could lead to intergroup conflict if these values are different. From chapter 2, intergroup conflict was identified as a threat in organizational. From the different views on distinct topics it seems inevitable that conflicts will arise as to who should help who and who should do what.

7.3 OPERATIONAL VERSUS MANAGERIAL VIEW

Apparently the operational core sees things differently than the managerial layer. From the requirements in chapter 3by the managerial layer and from the analysis thereof the service delivery should be improved in the new situation (2). The intended benefits the government sees aren't shared among operational roles. There is a different perception from the operational core towards which criteria are important, their effect and how they relate. Moreover operators have a different interpretation then expected of the criteria themselves. In this part the most important differences are discussed.

QUALITY OF SERVICE

From the results it can be concluded that operators see connections between the different criteria. The base for these connections is their view of quality. They see it as a primary criterion as explained in the section above. This criterion is seen by the operational core as an outcome of the system rather than a criterion to take into account when designing the system. This difference, though a bit abstract is very important to note because it implies that quality cannot be used as a trade-off. Operators think this so important that every negative influence of criteria on the quality of service will make them negative towards those criteria in general. Managerially quality is definitely a trade-off where costs, time and resources have to be weighed and measured. It might be important to managers trying to influence the situation to use this notion.

ONE-STOP-SHOP

Illustrative of the fact that operators look differently to the system as a whole is how the one-stop-shop criterion is judged. As displayed in appendix A.14, a causal relation is presupposed between the amount of errors made and the one-stop-shop. This does not comply with the definition a-priori of a one stop shop. From the definition given the amount of errors should not

directly influence the amount of one-stop-shop. A one-stop-shop is not directly linked to errors or should be influenced by errors. From this it can be concluded that the operators view one-stop-shop as a quality indicator rather than anything else. They are oblivious to the actual meaning of a one-stop-shop and frame it to their view of quality. Others do not see it as important at all.

SUPPORT OF/BY REGULATIONS

Regulatory support is linked to the amount of protocols with a negative relation. More protocols and the desired situation are seen as linked. This link, means that the desired situation (scenario 2) will need more protocols. This can be explained because of the suspected insufficiency of available knowledge, and the fact that protocols are seen as a means to decrease the knowledge need. The regulatory boundaries of privacy laws furthermore from different views give different issues. Within operational roles different views lead to different information needs. On a higher level information laws are imposed to ensure privacy, whereas police operators are less interested in privacy. Difference between operational and managerial layer is that operators see these laws more as an inhibitor of quality, whereas governmentally they have to ensure privacy for different goals. Goals don't coincide therefore.

NEEDED KNOWLEDGE

Needed knowledge is seen as knowledge sufficiency and thereby relates to quality. Knowledge need is seen as influencer of quality by operators, which is because they believe that specialism of operators in separate disciplines is preferred compared to multi-intake holism and they do not think the same amount of specialism can be reached which is bad for quality. It is strange however that they connect these two as it would suggest that the more specialization is used and the more separated the disciplines are, the higher the quality. This is difficult, as quality also depends on collaboration between the agencies, for instance in case of a fire emergency including injured people.

UNIFORMITY

Uniformity as criterion is also seen as an indicator of quality, but differently from operational then managerial perspective. Operators look at specialism and say that if you are a specialist you can help everyone the same way every time. On a micro scale this may be true, however to improve cross functional uniformity this is not true. They feel uniformity can become better in a multi-intake environment (especially scenario 3) but again feel quality is hampered, because of lost specialism. They see a trade-off between uniformity and quality, how much uniformity is wanted, and when will it begin to affect quality? From managerial perspective uniformity can lead to increased quality by standardization. The scope hereby of management is across the whole organization of emergency management, while within the EDC the scope is much smaller.

COSTS

Costs are seen as unimportant and moreover they do not have a lot of insight in how costs affect their job. They do not relate costs to quality thus. Importantly their views on costs can be an important insight for government as they believe costs go up do not care much about costs as for

their job it is not of direct influence. It can be concluded that they do not link costs to quality as such, where one might expect that more money could lead to more quality.

INFORMATION SYSTEMS SUPPORT

From a managerial view information systems are often seen as a holy grail for standardization and uniformity improvement; however operational workers see it more as a tool. A very helpful and important tool, but should not in their view decrease their professionalism by introducing protocols that automatically send unit for instance. From an efficiency perspective the information systems should improve the back-end, steering of calls and arrangement of road units. Operationally there is a fear that those systems cannot be take over the full complexity of the job. The opinion differences are logical because operators do not want to become assembly line workers and because they genuinely believe that it is too complex. However it is able to take over a lot of complexity and improve upon total quality. It is important to understand the view of the operators and not to overload them with it systems instantly.

7.4 CONCLUDING REMARKS

In general scenario 1 is preferred by operators but not by managers, which can be related back to differences in views on what quality means, and how trade-offs/considerations can be made.

According to operators no trade-offs can be made concerning quality and they see a lot of issues with the desired situation concerning the eventual quality. This is explained by the fact that they are projecting their opinion about the quality of the new situation on the scores for the criteria that in their eyes relate to quality. The government, strategically, doesn't feel this way as they look over the whole environment of different EDC's and deem other aspect important. Uniformity is a good example of this as explained above.

This chapter has shown the interpretation and discussion of the results. Relationships between criteria apparently exist. Very interesting is the fact that criteria relate in such a matter that trade-offs exist and no optimal scenario can be identified. The operational and managerial views of the situation are identified different. Conclusions can be made from this notion. The conclusions can now be drawn up as to how tasks at the EDC should be arranged and which considerations should be taken into account. The complexity has been unraveled by defining and evaluating the criteria and it is now known what exactly is important to take into account while designing a (new) task arrangement at the EDC

8 CONCLUSION AND RECOMMENDATIONS

In this chapter the main research question is answered and recommendations are given for policy makers on EDC task arrangements. First a general conclusion is given in section 8.1. In section 8.2 the considerations that should be taken into account by decision makers are described. This chapter concludes with recommendations on further research.

8.1 GENERAL CONCLUSION

This paragraph will give an answer to the research question posed in this thesis study. The most prominent knowledge gap defined in the beginning of this research is

> It is unclear according to which considerations the organization of an emergency dispatch center is and should be arranged in order to deliver better emergency dispatching services to civilians.

The main research question of this research thereby is:

> What are the most important considerations to the effective organization of an emergency dispatch center in order to achieve high quality emergency response considering different possible scenarios to its task arrangement?

First of all the question posed can't be fully answered, because a recommendation to a specific task arrangement can't be given, except for the answer: it depends. What it depends upon can be concluded as it depends on what is perceived important. The environment has proven more complex than can be perceived at the outset. Defining an optimal task arrangement is impossible because different criteria exist that influence the quality of emergency dispatching and moreover these criteria interact with one another so that trade-offs become necessary. The found criteria are *One-stop-shop, Uniformity, Quality of service, Costs of operations, Knowledge need, information systems support and regulatory support.* From the study it is concluded that optimizing for all the criteria is impossible. It is possible to optimize some of the criteria, but this affects others negatively as will be explained in the next section of this chapter.

It has been concluded that quality of service is a trade-off in comparison with other criteria such as costs. This is logical as governments have to trade-off different criteria because of e.g. scarce resources. However it has been observed that operators give such high scores to 'quality of service' as a criterion that it actually becomes an overall goal, more than a criterion. This leads to that every criterion score that influences the quality negatively is judged badly. Thus quality can't be traded off in the eyes of operators.

Mintzberg (2010) argues that organizational tension, that he calls 'pulls' exist in professional bureaucracies. The effect of this can be concluded. A bias from operators towards the current

situation can be explained by the fact that operators see quality as the most important criterion, and think that it is best in the current situation.

The governmental layer has a different view than the operational layer hence, it can be concluded that transitions will be resisted by operators and thus to minimize this chance actions should be taken. I suggest pilots, as will be explained next section.

8.2 CONSIDERATIONS TO BE TAKEN INTO ACCOUNT

There are three considerations that *have* to be incorporated when designing an effective task arrangement. Here the conclusions regarding these considerations are described.

Standardization versus professionalization (to pigeonhole, or let the pigeon fly)

Standardization, or the amount of protocollization, is an import choice that influences a lot of criteria. This makes it a basic choice or trade-off to designing task arrangements. Fully standardizing the work by including protocols would have a positive impact on the criteria 'uniformity ', one-stop-shop. Therefore it is thus important to decide on.

In a future scenario this can be resembled to *'..an assembly line type job would be created…'*. This choice can be made if uniformity is ranked most important together with one-stop-shop. Doing it like this would however decrease the knowledge need and therefore decrease operational costs.

Full protocolization and thus classification (*to pigeonhole*) decreases the quality of service, because it is impossible to perfectly pigeonhole every emergency. This is a practical proof of what is learned from Mintzberg (2010): 'the pigeonholing process is imperfect at best'. This is where the trade-off is with professionalism. Specialist opinions make sure that the situation is judged properly, so quality goes up, however uniformity might go down as well as collaboration and orchestration for combined emergency calls. More protocolizing increases the road units needed because of the pigeonholing problem as well. It leads to extra ambulance, police and fire department road units having to be put into action. '…current proQA ambulance protocol leads already to 40% priority 1 issuing of units, which later are called back' (personal communication: Zandstra, 2015). So eventually the costs might be distributed to outside of the EDC to the road units. Extra research here is needed, because as one of the governmental goals is to decrease costs, it has become apparent that it might only divert costs to other operations if the right choices aren't made.

To conclude this tradeoff can be seen as trading of the 'most uniform service delivery' and the "best individual judgment"

Specialism versus generalism (holism)

The desired situation (2) leads to more generalists and as a starting point, increasing knowledge need. Not every operator thinks it is impossible to do a multi-intake, but a lot of them think it will become too complicated. This leads to the earlier trade-off of putting in protocols, to decrease the knowledge need. It may not be expected of generalists to have as much in-depth

knowledge (specialism) as the specialists, which can have a negative impact on the quality of service.

Information sharing for collaboration versus information divide for privacy

From the research it has been found that an important impeding factor for changing the current task arrangement, as well as being a consideration for optimal task arrangement I are the regulatory boundaries that have been set. Regulatory issues are to be expected when changing task arrangements because of criminal law versus privacy (medical data) law. Now operators have separated workspaces and limited information sharing among ambulance care and other departments (e.g. police). Releasing data improves collaboration which improves the quality of service but a trade-off needs to be made because of the rules. Ambulance operators are concerned about healthcare and needing to protect privacy, where police operators are concerned with criminal investigations, wanting as much information as possible Thus the consideration is how to improve collaboration without breaking regulatory boundaries and overcoming the issue of losing too much quality by non-collaboration. In the desired situation where a multi-intaker has to do everything this tradeoff/question will have to be answered as one person can do all.

The above three trade-offs are the most important ones. To answer/choose there has to be an answer on how to judge and design each of the criteria that was investigated.

8.3 RECOMMENDATIONS

The recommendations are two-fold. The first part is concerned with policy recommendations for this study. The chapter is concluded with recommended further research.

8.3.1 RECOMMENDATIONS FOR TASK ARRANGEMENTS IN THE EDC

This research has given a starting point to think about policy decision making. It has opened the door to better collaborative decisions and more knowledge on task arrangements. The next step is to include this knowledge in the current transition process and generalize into other transition processes.

Operators have very limited to no impact on the decision making process. If they are not included they will still have to carry out the tasks as they are asked to. So what does that mean, or what is the problem? The problem is that if this is done then long-term effects might be negative for policy makers and more importantly civilians. A lot of centralization initiatives in the emergency sector are being turned back and responsibility given back to the local level. This is very possibly due to unexpected results that were not optimal. Decreasing the complexity of the situation by improving knowledge is a general concept that would have a lot of benefits in this transition. If it is known beforehand which problems arise on an operational level, then this saves money (not turning back measures) improves decision making consent (operators may agree more) and increase the quality of the new system. I recommend therefore, as the process is already going on, to do two things. As learned from theory, creating commitment increases the chance of success (De Bruijn et al., 2010). This can be done by including operators in the EDC

into the process. A proven concept of testing, which is relatively inexpensive and can bring to light how to deal with the considerations, is piloting. Pilot testing is now recommended and should be done as follows.

The starting point has been identified, namely criteria and differences in opinions about importance. First consensus about importance should be reached or at least differences discussed. Therefore operators should be educated that not only quality of service is important from a holistic point of view. The pilot should measure the performance for different values of the criteria. To do this a pilot setup needs to be made with different configurations based on the trade-offs that are found. The possibility is to make 6 different configurations for the three trade-offs, optimizing for different criteria and seeing the outcome. This will be the next step to getting insight in how to arrange the tasks effectively.

8.3.2 RECOMMENDATIONS FOR ADDITIONAL RESEARCH

A lot of extra research could be done in the domain of emergency response. It is very interesting and innovations made possible by increased technological capabilities make for a large research area to be exploited. Some recommendations for further research will be done in this section.

- This research has identified trade-offs between criteria. It is good to know what the 'optimal configuration' is on each of the trade-offs. As explained in the previous paragraph this can be done by piloting. It is however also useful to do desk research into the trade-offs. For instance as we found protocolling is important research into what set of rules and regulations would be optimal and how to deal with or change regulatory boundaries would aid the research field.

- The focus of this research is on the operational effects of organizational transition of the EDC. It is relevant to do further research as to the differences between the managerial and operational layer. More insight in these differences makes sense.

- Considering the scope of this research was on 'normal' circumstances in the EDC, it is interesting to investigate disaster situations. In this case hierarchies and responsibilities on organizational level change which may have another effect on the operational level. Including this would be good to get an overall view of every important aspect in the EDC. A good starting point for that research has already been given in this study so that that study starts with a thorough basis.

- Current research could also be done at other EDC's or validated at other EDC's to improve the generalizability of the results. Also it is very interesting to look at other sectors with similar transition processes. An example is the centralization of power by combining provinces into super-provinces. The feasibility is currently being investigated by the Dutch government. It would be interesting if the same notions apply in such a domain.

- The current investigation could be further quantified by expanding the quantitative study over other EDC's. Maybe differences are found that are due to current differences in ways of working. This could lead to best practices. These can be used as a starting point for designing improvements to perform better.

9 REFLECTION

In this chapter the reflection on this research is described. First a reflection on the added value of the results is given. Subsequently a reflection theory is provided. The methodology, scope and criteria design are thereafter discussed. Finally a personal note on the realization process is portrayed.

9.1 REFLECTION ON RESULTS AND THEORY

9.1.1 GENERAL ADDED VALUE

The research into the particulars concerning emergency dispatching in the Netherlands adds value to the research field as it is one of the few researches into 'normal' emergency operations, where most research focuses on disaster management. The analysis provide proof for operational managers that for complex technological and organizational transformation in the decision making process the differences in perceived outcomes need to be incorporated to make better informed policy choices.

The Director of the Rotterdam-Rijnmond EDC; Jolanda Trijselaar mentions the value of this thesis report to the ongoing transition process in the foreword of this thesis. It contributes to understanding the background for current concerns and adds value for upcoming management discussions in which choices will be made on how to deal with the transformation. Also concrete value is added as input for upcoming pilot testing.

9.1.2 REFLECTION ON THEORY

This study has focused on understanding what the considerations are that make up an effective task arrangement at an emergency dispatch center. Thereby the focus was on organizational changes starting from the transitions that are currently occupying the EDC environment. Therefore organizational theory was used which proved sufficient to detail the complexities of emergency dispatch operations. It was more difficult however to explain the internal differences within operations.

A thorough empirical analysis had to be done which contributes to the understanding of Dutch EDC operations in general and the complexity of changing these. With the concept of organizational pulls it was possible to describe possible tensions and identify possible bottlenecks for effective task execution in a changing environment.

The results show that an optimal arrangement is not feasible. The research opens the door to making policy decisions, but further research must be done to in-depth investigate how to deal with the change process in order to for instance get an agreement on task arrangement that will be most optimal.

9.2 REFLECTION ON METHODOLOGY, SCOPE AND CRITERIA DESIGN

Interviews

Using interviews has proven a very good way to gain an understanding of the problem. Because it was possible to interview managers and operators that are first-hand experiencing the transformation, or are actively involved the quality of the data gathered can be considered very high and the information very useful. A lot of information gathered during interviews is not found in literature and thus this report provides information that has not been written down and combined before. A lot of in depth information especially was gathered during expert meetings of which in the authors opinion no better suitable way of data collection is available.

The three types of interviews (group discussions, semi-structured one–on-one and the multimethod evaluation surveys) suited the different types of information needed in different process phases very well. Because of the complexity that the project organization struggles with the early discussions helped in finding common ground on what the problems at hand were. This was particularly useful for quick and high quality iterations in the difficult scoping process. Considering the seven interviews in the analysis phase were enough to grasp different sides of the story and while more information is always obtainable from more interviews the amount was fit-for-purpose. Lastly the evaluation interviews where very helpful. In retrospect another setup could have yielded more survey results but the EDC work environment proved difficult. Especially without too much intrinsic motivation and because of mere work related stress by operators the time they had to devote to answering the survey and questions was limited more than was desirable. This meant the interviewing process also took a lot longer than expected.

Desk research

The desk research done provided especially helpful literature for understanding the context of the problem. A lot of scientific research in the emergency sector however is devoted to disaster management and not particularly to 'normal' emergency management. The differences seem negligible but aren't as in disaster management very different organizational (hierchical) and governance issues arise. In general a lot of time was put into desk research for understanfing and outlining the research subject. Focus is needed to 'know what you need to know', which is difficult when so many unknowns about the transition exist that experts also are faced with these questions.

Data gathered

The data / information in terms of reports and interviews are only gathered in the area of Rotterdam, whereas other areas could have different characteristics which are now not found. This must be noted as it may decrease the generalizability, although in any case only partial analysis of reality can be done.

The quantitative data give a concise image of the operational perspective towards the criteria, but the data cannot be statistically analyzed due to a lack of respondents. Statistical analysis was not the goal of the quantitative part, but as such no significance can be examined as to the

generalizability of the results. The extensive qualitative empirical study, including a lot of operational experts increases the validity of the qualitative conclusions. The level of education of some respondents might inhibit the broadness of their answers and thereby the depth of analysis results data. This said, they have more expertized then the author and also the only experts on the operational level, and the conclusions have provided numerous interesting insights.

9.2.1 SCOPE

The research done is of exploratory nature. This exploration started with a lot of problems, a lot of unknowns and a lot of potential research subjects. The determination of the scope was an iterative process, which can be said is often the case in these types of research. It has proven difficult to find the system boundaries at the beginning of the research. Especially when entering an organization which itself is very much searching to define the problems, scoping difficulty is increased and research boundaries can easily become blurry. This leads to scope creep in the research and decreased focus in the early stages, making the process more time consuming. The experts in the field were of a lot of help to clarify the most prominent issues. However there again a risk exists as different experts intend to have different views on what is important and if one takes into account all that these experts deem important than as a researcher scope creep happens. A lesson to learn from this is to be critical and challenge the expert opinion with your own.

There is an equivalent rise in knowledge as in perceived complexity of the problem. It can be compared to the complexity of a bike. If you do not know much about it you can imagine building one with two wheels, treadles and a frame. When investigating you find out that there are different types of wheels, frames and treadles, and furthermore that the relations between how they interact are thereby influenced. 'Increased perceived complexity' as the author calls this can be problematic as it can make one oblivious to the actual goal or most prominent issues that are being investigated. This all has to do with scoping. Scoping is very iterative, and good scoping is difficult. I found myself getting stuck in a spiral of complexity more than once. By interviewing and short follow up communication and iteration steps slowly more structure can be brought into this.

9.2.2 CRITERIA DESIGN

Another method of criteria design is by expert validation beforehand. This research does not involve explicit criteria validation, only implicit by 1) the fact that from literature and preliminary interviews these were gathered and 2) because the results of the evaluation surveys show that criteria are mostly deemed important for task arrangements. However more criteria could have been important. Moreover the robustness of the criteria would have been substantiated more if validated by experts.

9.3 PERSONAL NOTE

When writing a master thesis one becomes more and more expert on a specific topic. There is joy in becoming more knowledgeable about a subject and being able to arrive at educated conclusions. The learning process hereby starts, continuous and ends with interactions; Interactions with experts, teachers and colleagues. At the beginning the author saw these meetings as necessities for data retrieval, but they have proven to be much more the center of being able to get further in the process. Moreover they help to get excited and to keep moving forward or to give new boosts when getting stuck. This mindset I will remember to keep in mind for my next assignment or research.

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10 APPENDICES

A.1 SCIENTIFIC ARTICLE

Task Allocation in Emergency Dispatch Centers

Evaluation of different task arrangements for the integration of emergency dispatching services from different organizations

S.C. van Duijn*

Delft University of Technology, Faculty of Technology, Policy Analysis and Management, Jaffalaan 5 2628BX Delft, The Netherlands

Abstract – The Emergency Dispatch Centers (EDC) of police-, fire- and ambulance are the integral hub for emergency dispatching. Emergency response is an important governmental task, requiring coordination and collaboration between and within different agencies. Because of the developments in technology it is possible to improve emergency dispatching services to civilians. This requires however new ways of working and it is unclear how in this light operational tasks should be allocated to achieve high quality emergency response services. The article aims three alternative task arrangements. Results show that no best task arrangement exists, and considerations between performance indicators are necessary. This is due to the different perspective from the operational and political level. The findings show that a key concern is with the institutional change instigated by the government. Decision makers should take into account the operational perspective when designing a suitable task arrangement. Standardization versus professionalization, specialism versus generalism and information sharing versus information divide are thereby the most prominent considerations.

Keywords – Emergency Dispatch Center (EDC), task arrangements, institutional change, scenario analysis, considerations, evaluation

*Sjoerd Coenraad van Duijn – svduijn@gmail.com

Introduction

Currently a centralization effort is being made by the Dutch government to bring back the number of semi-autonomous Emergency Dispatch Centers (EDCs) from twenty-five to ten, including one central coordinating body. Also operational roles are being redesigned to decrease costs, improve uniformity, efficiency and eventually the overall quality of emergency response. The Emergency Dispatch Center of Rotterdam-Rijnmond is one of the EDCs in the process of designing new task arrangements according to the new governmental guidelines (Ministry of Safety and Justice, 2013). Problems can arise when institutional and technical changes to the emergency management sector are initiated as is the case in the Dutch Emergency services sector (Transitieakkoord, 2013).

Responding to emergency situations is a complex task because of the different types and consequences of emergencies. An emergency can be defined as any situation caused by nature or man, harming people or property (Shen & Shaw, 2004). There are a lot of agencies involved in the organization of emergency response services. Consequently regulation and collaboration schemes

are set up to deal with the challenge of delivering high performance emergency response services (Chen & Decker, 2005).

The EDC is the central 'hub' for emergency dispatching and thus the vital link in the emergency response process. Operators from the Police-, fire- and ambulance care department work together in the EDC to initiate the course of action in case of emergencies. They do this based on incoming emergency calls. The current Dutch emergency response services landscape is subject to institutional change driven by technology (Ministry of Safety and Justice, 2013). Although initially small and modifications were made, it becomes clear that a transformation is required. The current task allocation is not suitable and needs to be reallocated. Coase (Coase, 2015) argues that institutional (re)design governs the performance of the economy on a macro scale. Its systems should therefore be carefully designed in order to perform well. This means that in-depth knowledge is needed of the processes and tasks at the EDC to be able to make well informed decisions on the allocation. Where the government decides on rules and regulations, the way that tasks are executed is often not set in stone. This means that there are choices that can be made on how to arrange tasks on an operational level.

The institutional structure can be seen as a professional bureaucracy where different agencies cooperate to provide emergency response services (Mintzberg, 1983). The responsibility and task allocation in the emergency response services sector are a result of historic growth and fine tuning. Van Duijn (2015) describes it as the 'sunk cost of innovation' through the historic evolution of the sector. This means that new decisions are made in light of the already existing structure and not from scratch. This makes redesign difficult, because you need to deal with the existing structure, and there is a limited amount of resources available.

This article is based on the research done by van Duijn (2015) into task arrangement design considerations. Three operational task arrangement scenarios at the EDC are evaluated. Political and operational views differ to what is the best scenario. There were considerations found that need to be taken into account to design a suitable task arrangement.

This article examines which task arrangement is considered best and which considerations need to be taken into account when designing task arrangements. Three alternative task arrangements are evaluated by quantitative and qualitative interviews of different EDC operators in a case study at the Rotterdam-Rijnmond EDC. Considerations were found concerning choices to be made. This includes deciding on the amount of professionalization versus standardization and deciding on uniformity of process outcome by procedurizing tasks or by specializing of operators (van Duijn, 2015).

An attempt is made to understand which effects different task arrangements have on the effectiveness of the system as a whole, looking from the operational perspective which is not included in the decision making process. The structure of the article is as follows. First the background of institutional change is explained to establish why issues can arise. Then the research design is presented which includes the setup of the evaluation. Next, the three alternative task arrangements are explained and results of the evaluation are discussed. This leads to conclusions and recommendations concerning the main topic.

Background

This section explains the background to answering the research question. The goal is to determine which task allocation is best. This task allocation is an institutional redesign and thus first a general analysis of organizational structure is done to give insight in institutional design. With this background knowledge possible issues are identified that show why different arrangement may or may not be preferred by different layers within the public organization.

Institutional change concerns the changing of structures, so to investigate design, knowledge of the current and future structure of the emergency service organization gives insight in possible tensions between organizational levels. In this case tensions between the operational and national (decision making) 'layer', that might arise from the transition from the as-is to the to-be institutional 'system'.

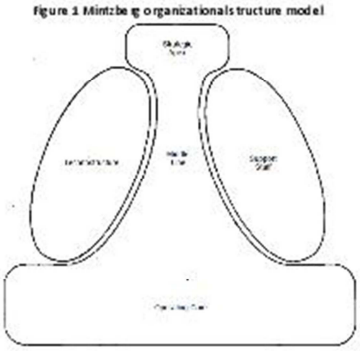
Institutions are structures that are arranged formally (Edquist, 2004) and are characterized by their stability (Goodin, 1998) and therefore predictability (Koppenjan & Groenewegen, 2005). This implies also that they are hard to change (Koppenjan & Groenewegen, 2005). It is argued that

the forces playing a role concerning tasks and responsibility allocation are important to investigate. (Van Duijn, 2015).

In the context of organizational change within a multi actor setting with interagency collaboration knowing which tensions might play a role is important. It can be reasoned which outcomes of the innovation process are to be expected, based on the approach taken, which forces play a role and how to manage these forces. Although the national government in the end is able to decide how to arrange things, intergroup conflicts can be expected, which has a negative effect on the coordination of tasks between different parts of the organization (Schermerhorn, Hunt, Osborn, & Uhl-Bien, 2010).

There are implications found for coordination and collaboration on the operational level from the strategic decisions that are made (van Duijn, 2015). A lot of the implications arise from the inherent structure of the public organization. Henry Mintzberg (1983) proposes a model to rationalize organizational structures, put them into context and identify the possible tensions. He structures organizations as consisting of five different parts and identifies dynamics that exist between these parts (*pulls*). The parts that make up the organization are the strategic apex, middle line, operating core and techno structure and support staff. Different mechanisms and tension play a role depending on the structuring of the organization.

Figure 1 Mintzberg organizational structure model



In a professional bureaucracy the operating core consists of specialists (professionals). Operators are categorized on the basis of their skills in order to couple them with issues that need to be solved (van Aart, 2006). This categorization, or classification process is defined by Mintzberg (1983) as *pigeonholing*. The concept of pigeonholing is important because categorization in a professional bureaucracy is not perfect. Meaning that who is exactly responsible for what is not always clear nor always agreed upon.

To ensure or improve high quality of service there has to be agreement on this categorization. Possible considerations are needed to decrease the chance of innovation failure, or increase the chance of successful transition to a new system.

This article is particularly interested in the tension that the decisions have on the operational level. The operating core is responsible for primary tasks related to the organizations' products or services. They perform operations to 'transform inputs into outputs'.

The strategic Apex as Mintzberg (1983) calls it, in this case is the Dutch national government and consists of the management of the organization or government. In this case the Ministry of safety and Justice (Ministry of Safety and Justice, 2010). They carry the overarching responsibility for designing and supervising on the organizations main goals, the strategy and policies.

As said the responsibility and execution layers are divided and views upon how to arrange it too are different. Management tries to increase influence by standardization and centralization whereas operations prefer professional freedom. Political considerations are different compared to operational considerations because of the different viewpoints involved, different knowledge and because political, games play a role in decision making. This leads to compromising instead of optimizing. On the other hand operators lack a holistic view.

Table 1 evaluation criteria

	Criterion	Description
1	One-Stop-Shop	This criterion is meant to judge the best option for handling calls in the first contact. The derivatives of a one-stop-shop include increased clarity and speed for the caller and simplicity/clarity of orchestration
2	Uniformity	It is meant the extent to which it is possible to supply a uniform service to callers (independent on the type of emergency call)
3	Quality of service provided	With this criteria it is meant the availability and reachability of the service for civilians, including the needed time and correctness of how the call is handled.
4	Costs of operations	These are the operational costs associated with the scenario, compared to other scenarios
5	Knowledge requirements	The impact of scenarios on the needed knowledge and competences of operators in the emergency dispatch center.
6	Support by information systems	The amount to which each scenario can be supported by (current) information systems
7	Support of/by regulation	Evaluation of scenarios impact on regulations or vice versa (the regulations effect on the feasibility of the scenario)

Research design

The goal of this research is to evaluate various alternative task arrangements for the Dutch EDC to find considerations to their design. This is done by evaluation of three task arrangement scenarios. A multimethod approach was used (Miles & Huberman, 1994). The tools were used to ensure a representative opinion, while limiting the amount of time needed. The amount of time was limited by the fact that operators cannot leave their post during working hours. Therefore no group session was chosen but instead within the EDC all operational roles were questioned during their work, using a quantitative survey and accompanying questions. Thirteen participants selected from the four different operational roles in the EDC were included, as was an extra supervisor role. The quantitative survey included weights to be given to investigate the opinions of operators on importance of criteria. This way priorities could be identified.

The research setup was as follows:

1. Preparation (interviews and document analysis)
    a. Identification and analysis of current and (possible) future task arrangements
    b. Identification of evaluation criteria
    c. Evaluation survey setup and description
2. Evaluation
    a. Presentation of survey
    b. Explanation of criteria and weighing factors
    c. Discussion on given scores, opinion about it
3. Reporting results
    a. Combining quantitative and qualitative data from interviews
    b. Result interpretation
    c. Reporting

One researcher was present to explain the questionnaire and facilitate the questioning sessions which were held during one whole day within the Rottterdam-Rijnmond EDC.

Three alternative scenarios

The operational roles involved in the study were the police-, fire- and ambulance centralists, responsible for call issuing, as well as intakers which are currently responsible for the first contact with an emergency caller and putting them through to centralists. The main goal for investigating the three arrangements with the operators is to evaluate if the requirements from the government and the intended benefits of the changes wanted by them do in fact occur, or that different opinions exist with operators. Van Duijn (2015) defines the front office as the intakers and the back-office of centralists. The responsibility for call handling can be assigned to the front and/or back offices in different ways.

The evaluation criteria that van Duijn (2015) found were used in the questionnaire. Requirements to the system agreed upon by politics influence the outcome of how operations are (to be) carried out. In addition to this, helping clients in the first contact as much as possible is desired. From the requirements and preliminary empirical research a list of possible criteria was set up. This list had to capture the important aspects, but also be understandable and able to be put into a questionnaire. This starting point was inspired by (Janssen & Gortemaker, 2010) and it resulted in a

list of seven propositions and descriptions, depicted in table 1.

Task arrangement scenarios

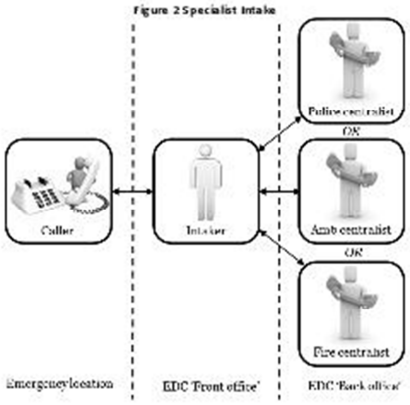
From different imaginable options three scenarios were designed to investigate different opinions about the performance of the system. Scenario 1 has been named *specialist* intake. It depicts the current situation of co-located, but not very integrated emergency call handling. Scenario 2 is called *Multidisciplinary intake*. The desired situation is depicted in this scenario. The third scenario is the true 'multi-intake' scenario without backup. It has been named *One-Stop-shop intake*.
These three scenarios have a different responsibility division and collaboration.

Currently the EDC consists of intakers, centralists of police-, fire- and ambulance care dept., and general supervisors. The first scenario consists of the following operational roles (figure 2);

- An intaker responsible for taking the emergency call and setting up the initial report before forwarding to a centralist. The intaker sends the call to the most knowledgeable centralist based on the request of the caller. The most knowledgeable centralist is chosen based on the emergency request.
- The centralist is responsible for further questioning and for issuing units and monitoring units on the street. There are three different centralist roles in the EDC which are the Police centralist, responsible hen police is needed, Fire dept. centralist responsible for issuing calls when the fire dept. is needed and an ambulance care dept. centralist is responsible when medical assistance is requested.
- Usually one or two supervisors are also present in the EDC. They oversee/manage the processes and help out when/where necessary. This is the current situation.

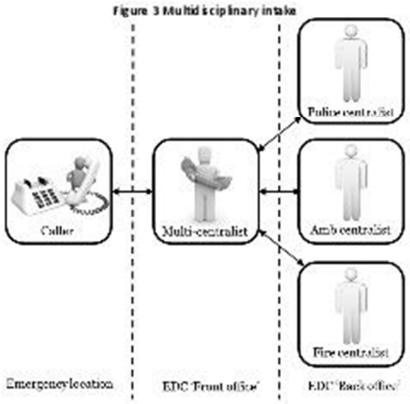
Compared to scenario 1 the second has a different allocation of responsibilities (figure 3). In this multi-disciplinary intake scenario the intelligence (orchestration) lies partly with the centralist and partly with the back office specialist. Dependent on the type of emergency and its complexity a lengthened intake can be set-up.

Figure 2 Specialist Intake



These are backup centralists that can be involved in case a centralist cannot handle the call be him/herself. This scenario is based on the initial idea that has been designed by the government to decrease the amount of operators and improve efficiency and uniformity.

Figure 3 Multidisciplinary intake



The third scenario (figure 4) resembles the second scenario, except for a distinct difference. No lengthened intake is involved. This means that no backup is available anymore for the centralist. Orchestration lies fully within hands of the multidisciplinary intake centralist. He/she handles the call in the first contact and is expected to have sufficient knowledge to handle any type of emergency call.

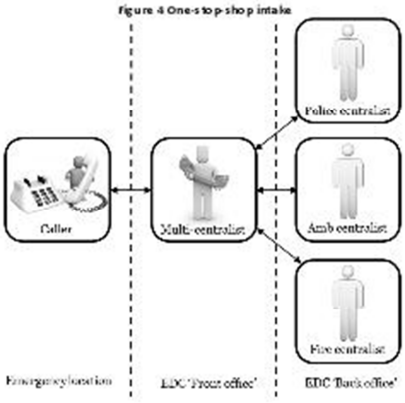


Figure 4 One-stop-shop intake

Results of the evaluation

The average results from the scores given on a five point liker-scale in the questionnaire show that the operators at the EDC have a preference towards the current situation, scenario 1. The current task arrangement scores high on the seven criteria compared to scenario 2 and 3. This means operators do not think that the desired situation wanted by the government, nor the complete multi-intake scenario (3) are an improvement on the criteria.

The average scores given per criterion are displayed in figure 5. Some surprising and interesting things are seen. First of all a lot of the expected and intended benefits stated by the government, which have been the justification for the new organizational and task structure, do not seem to be seen as such by the operating core. Concerning a one-stop-shop (OSS) for example, the hypotheses is that multi-intake leads to less different contacts for callers. This does not seem to be perceived. Furthermore scenario 1 covers other scenarios except for the score on uniformity (UNI). Scenario 3 is observed as more positive, because collaboration between departments is currently found to be limited. However this criterion is ranked 5th in terms of importance compared to the other criteria.

Another result is that protocols, which are seen as part of the information system support criterion (ITS), have a lot of influence on the way of working which can have a large impact. Seemingly, more relationships exist between and within criteria that determine the feasibility of the future scenarios compared to the current situation.

Under the presumption that new protocols will be introduced to standardize the output in the desired situation, one of the respondents described the desired situation as *'assembly line work'*. This is something operators are very much against for that they lose freedom and think it decreases overall quality because it is impossible to categorize all incidents perfectly leading to mistakes. As explained thus the protocols can be related to the pigeonholing classification process that is not perfect. A balance needs to be found thus for the right amount of protocols.

Mintzberg (1983) argued that organizational tensions, that he calls 'pulls' exist in professional bureaucracies. The effect of this is visible. The bias from operators towards the current situation can be explained by the fact that operators see quality as the most important criterion, and think that it is

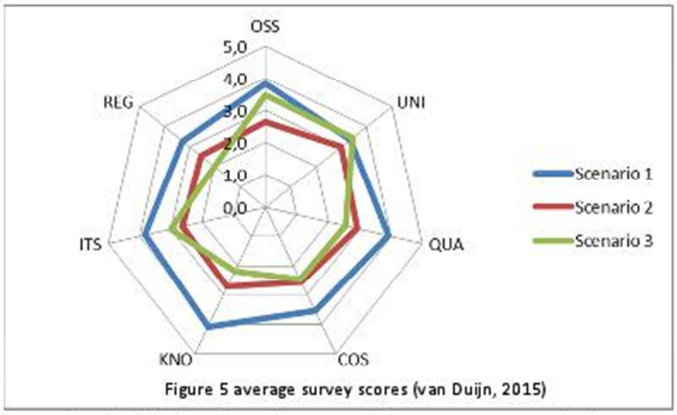


Figure 5 average survey scores (van Duijn, 2015)

best in the current situation. The governmental layer has a different view than the operational layer hence, it can be concluded that transitions will be resisted by operators and thus to minimize this chance actions should be taken.

Considerations

From the results there are three considerations that should to be incorporated when designing an effective task arrangement. The first consideration or trade-off is how to decide on *Standardization versus professionalization*. There is a trade-off between standardization and getting the 'most uniform service delivery' versus the "best individual judgment". The pigeonholing process as explained is imperfect thus a trade-off exists. The second consideration is *Specialism versus generalism*. The desired situation (2) leads to more generalists and as a starting point, increasing knowledge need. Not every operator thinks it is impossible to do a multi-intake, but a lot of them think it will become too complicated. This leads to the earlier trade-off of putting in protocols, to decrease the knowledge need. It may not be expected of generalists to have as much in-depth knowledge (specialism) as the specialists, which can have a negative impact on the quality of service. The third consideration is about *Information sharing for collaboration versus information divide for privacy.* Regulatory issues are to be expected when changing task arrangements because of criminal law versus privacy (medical data) law. Releasing data improves collaboration which improves the quality of service but a trade-off needs to be made because of the rules. The consideration is how to improve collaboration without breaking regulatory boundaries and overcoming the issue of losing too much quality by non-collaboration.

Conclusion and recommendation

Apparently the operational core sees things differently than the managerial layer. Though the government believes that a new way of allocating responsibilities will improve the performance according to operators there is no scenario available that satisfies all criteria completely under the current circumstances. There are specific choices that need to be made concerning the overall quality desired, the amount of standardization and specialization and how to deal with privacy issues. These issues need to be considered in order to be able to design a task arrangement that will be suitable not only from a political perspective but also incorporates the insights from an operational perspective. For this the glass wall between the decision making authority and operating core needs to be broken down to improve the chance of an agreement on a task arrangement that is best suitable for Dutch EDC's. Because of the political and operational view differences there is no best arrangement, but considerations are found that can adi in designing a suitable task arrangement.

The focus of this article was evaluating three task arrangements at the EDC. It is relevant to do further research into the differences between the managerial and operational layer. More insight in the differences makes sense. The current investigation could for instance be further quantified by expanding the quantitative study over other EDC's. The results show that an optimal arrangement is not feasible. The research opens the door to making better policy decisions, but further research must be done to in-depth investigate how to deal with the change process on a larger scale.

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8

A.2 ORGANIZATIONAL PULLS MINTZBERG

Strategic Apex; Ministry of Safety and Justice

- From the literature section it becomes clear that it is possible to put the ministry in this study. The Ministry is agenda setter and decision maker. They have the end-responsibility responsible for the laws and policies concerning safety. I acknowledge the involvement of other ministries identified in the environment (Appendix A.9), but their involvement is much more indirect.

Middle management; LMO and Regional organizations

- The execution of the decisions is left to the LMO. It will be responsible for coordination and operation of the emergency dispatch centers throughout the Netherlands. They are top of the middle line.
- Regional fire department, RAV and police department. They are responsible for turning the strategy into actions. They are driven by the rules formed by the strategic apex and can decide (in general) on their substance.
- Project organization; responsible for the exact substance of the execution of the transition based on the transition agreement (Ministerie van Veiligheid en Jusitie, 2013)

Operating core; MKP, MKA, MKB

- The execution of dispatching tasks are done at the operating level of the different agencies of MKP, MKB and MKA. They are responsible for the direct execution of dispatching and dispatch related tasks.

The support staff and technostructure are kept outside of the scope of this study as they do not involve the primary processes. The technostructure is partly filled up in the project organization.

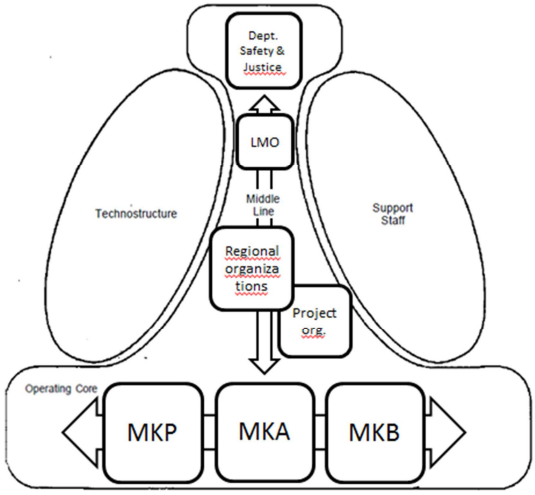

FIGURE 27 MINTZBERG MODEL EDC ORGANIZATIONAL POSITIONING

A.3 MANAGERIAL REQUIREMENTS

Type	Must Have	Want To Have	Nice To Have
financial	Structural budget cut of 50 million euro per EDC in 2021		
institutional	10 future EDC locations	As much standardization as possible	every centralist is trained and certified
institutional	Questioning protocols		fully integrated multi-intake
technical	Standardized National EDC System (NMS)		
institutional	Closure of 112 central in Driebergen	Backup support through lengthened intake	
social	Multidisciplinary operators	knowledge support and training	no more lengthened intake backup necessary
social / institutional	Ambulance centralist needs to have had education	helping civilian in first contact	

TABLE 4 REQUIREMENTS FOR DESIRED SITUATION (SOURCE: TRANSITIEAKOORD, 2013)

A.4 ORGANIZATIONAL STRUCTURE LMO

The national emergency dispatch center organization LMO is yet to be set up and will become the formal organization responsible for operating emergency dispatch centers. The figure below gives an indication of the structure of the organization of LMO, set-up and improved with the initial interviews as explained in the research design (chapter 1.6). It helps give insight in the hierarchical situation.

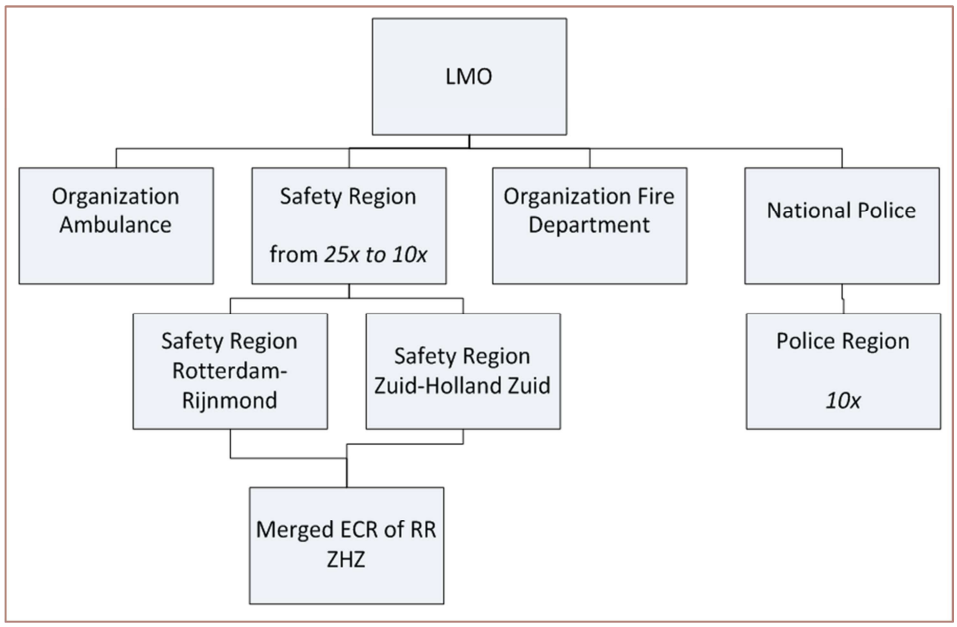

FIGURE 28 HIERARCHICAL ORGANIZATIONAL STRUCTURE LMO

The LMO will become responsible for coordination and operation of the emergency dispatch centers throughout the Netherlands. One of the goals within the new LMO is: **decreasing the current number of emergency dispatch centers, by merging different emergency dispatch centers**. This has numerous implications for the scale of operation. One of the mergers is the merger of the dispatch centers of Rotterdam-Rijnmond and Zuid-Holland Zuid. Through the *project merge control rooms* the union is being organized to respond to the changes that must be made to the new situation. The LMO will serve customers of four so-called "columns" being:

1. the national police organization
2. ambulance organization
3. fire department
4. safety regions

The *project merger of control rooms* includes public safety services in the two regions in question and also the Service Regional Operational Centre (DROC), the mono part of the police control room for the regional unit of the national police Rotterdam (Safety Region Rotterdam-Rijnmond,

2013). Not only these organizations but also other safety regions, and other organizations on operational level are partners.

Information management in the EDC is focused on quality. The amount of applications now running at the emergency dispatch center of RR is approximately 86 applications (Personal communication: Meelis, 2014). And it has been an ongoing discussion to innovate and change. Not merely because the government wants to standardize systems along the to be set-up EDC's. The systems now are design on specific agency needs (personal communication: Felius, 2015). It is a bottleneck how to arrange/improve the information landscape to optimize the system. (Personal communication: Hartman, Huizing, Langerak, Meelis 2014).

A.5 PROCESS DIAGRAMS IDEF0

IDEF0 Diagram

The main task for the EDC is emergency call handling. To model the emergency handling process an IDEF0 diagram is used, because it can represent activities, processes, operations and actions within the EDC as well as the data used for each activity (Dorador & Young, 2000).

An IDEF diagram consists of boxes and arrows. The boxes represent activities or functions and the arrows interrelate different functions or activities (Dorador & Young, 2000). This IDEF0 diagram is the "as-is" diagram. This diagram gives insight in the current process and helps evaluate the changes of the system. The IDEF0 diagrams are made by the author through using interviewing, shadowing and available literature on the emergency handling processes in the Netherlands.

Starting at the highest level of abstraction the activity is "emergency call handling". There Is an input for handling an emergency call, as well as some output. Controls and mechanisms resp. steer and support the activity.

- Input: an emergency call. This can be either mobile or not, civilian or professional
- Controls: procedures and laws are formal controls that limit and steer course of action for emergency handling.
- output: Referencing of supporting services and storing of received information for later usage are the main output of the emergency call handling processes.
- Mechanism: these are the supporting components, people, systems. In the emergency call handling process these are the intaker taking initial calls, the Centralist, phone system, information system and applications.

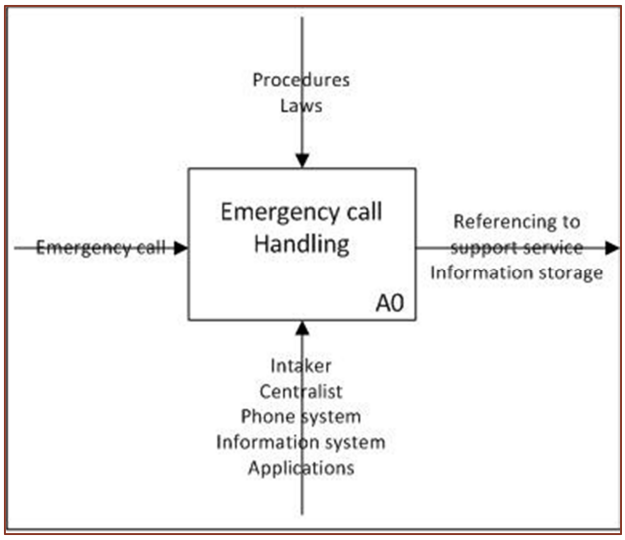

FIGURE 29 IDEF0 DIAGRAM OF EMERGENCY CALL HANDLING

Emergency dispatch processes

The emergency dispatch center (EDC) is the control center from which the deployment of units is coordinated and controlled, and from which the information traffic with different relief workers takes place. The quality of the information given to relief workers is thereby important (De Bruijn, 2006). Figure 3 shows an Integration DEFinition for Function (IDEF) diagram with a simplified representation of typical activities and information flows in the handling of an emergency call. IDEF is built on Structured Analysis and Design Technique (SADT) and can be used to model the activities, input, output, controls and mechanisms within a system (Grover & Kettinger, 2000). The activities are primarily governed by procedures performed using a centralist and supporting applications. As output it has the request for execution of the emergency help service and the storage of information obtained during the process. A detailed description of the IDEF processes can be found in appendix A.6

In this part the main processes at the EDC are analyzed as they are carried out at the moment. After this the future situation is detailed upon, which leads us to describing the main differences, bottlenecks and trade-offs. The main emergency call handling process begins with an emergency call. The focus is on civilian emergency calls. For handling emergency calls procedures and laws aid as well as limit the way off handling the call.

There are different procedures applicable for handling an emergency call. These are set up mostly in Service Level Agreements(SLA 's). Within the Fire Dept. (SLA) Ambulance (SLA) and Police (procedural agreements). As explained in ch 3 different laws apply to the emergency response environment. In these laws also the boundaries are set to ensure a quality standard of emergency

response. Different aspects are taken care of like time to handle a call, time to be on the scene. These laws represent boundaries to the system from the viewpoint of the EDC.

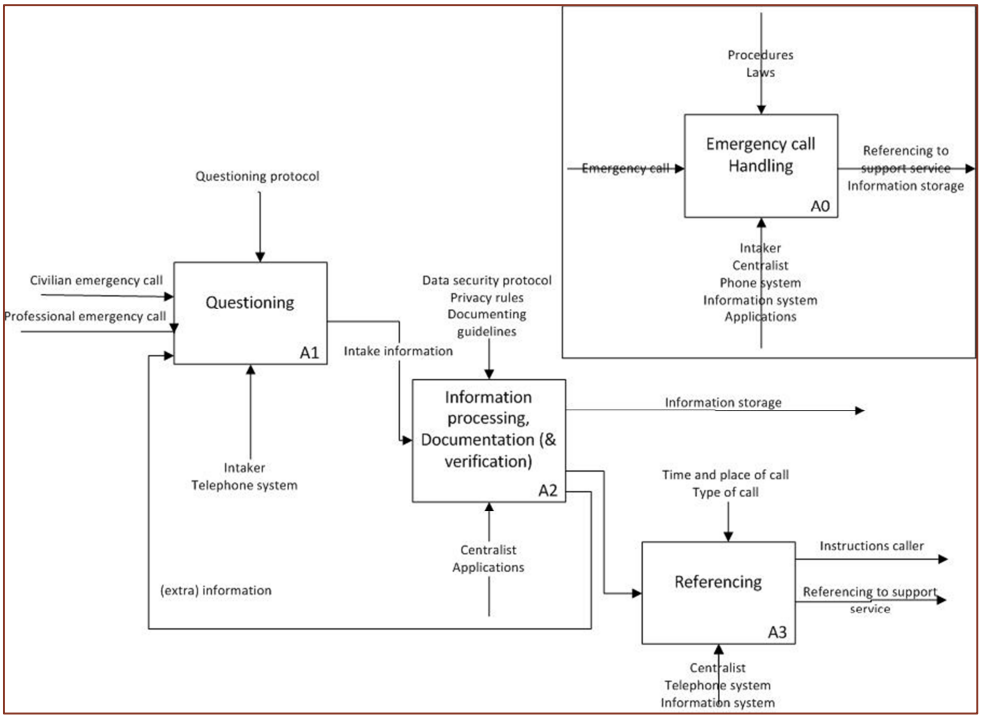

FIGURE 30 IDEF CURRENT SITUATION

While this picture is straightforward, behind it lays a complex environment that needs to be managed. This environment on the strategic, tactical and operational level consists of;

- Different agencies to collaborate in both network as hierarchy
- Information flows that need to be governed, information sharing mechanisms
- Work processes and ways of working
- Coordination and orchestration of tasks
- Legislative limitations
- Complex organizational and decision making structures

-

Managing this is a complex task in the emergency room because of the size and diversity of the information flows, actors and processes involved. Sharing information requires many different systems to be aligned. Many different requirements (Appendix A.3) must be achieved from a policy perspective and many complex organizational barriers must be taken into account. It is a

challenging task to deal with these dynamics. Looking at the differences between the current and future state a first demarcation of possible differences, becomes visible (Bakker et al., 2011).

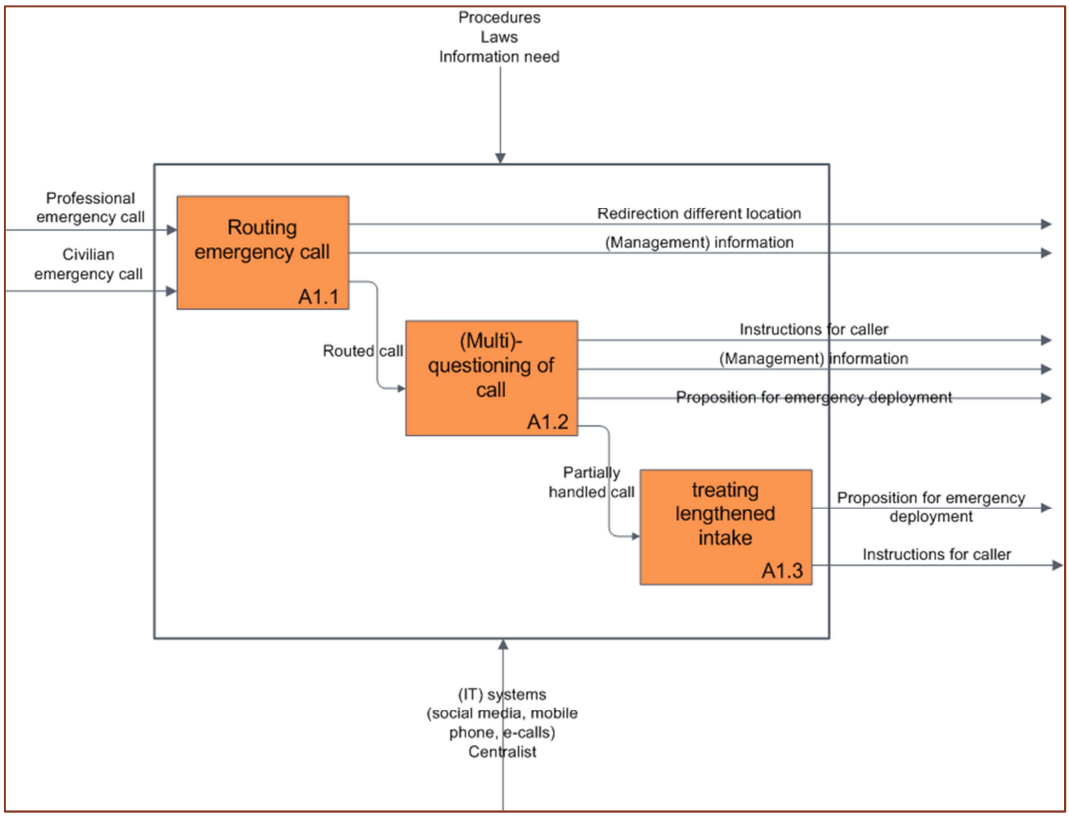

FIGURE 31 IDEF FUTURE SITUATION

The main differences can be found through examining the differences. Most intelligible difference is that between task A2 in fig. 30 and task A1.2 in fig 31. The task is becoming more complex. First of all it is important now to understand what exactly these differences entail. Which are the most important differences and how to go about them. This task complexity is thus a general issue for changes in the system.

A.6 TASKS AND ROLES IN THE EDC - BPMN

Business Process Models explanation

In this appendix the Business process models that describe and visualize the current (IST) and future (SOLL) processes, actors (roles) and systems are explained.

What

Managing business processes, formally known as Business Process Management (BPM) is used to more effectively execute business processes via analysis, management and development (design) through different tools and techniques. The overall goal hereby is to improve added value to the customer by optimally arranging and utilizing these processes (Paulk, 1995).

Why

Models are hereby used to gain insight in processes in order to e.g. investigate value adding opportunities in organizations. Working together in organizations requires different forms of communication and mutual understanding to be able to successfully reach common goals. The EDC is situated in an environment where a actors and responsibilities (see chapter 3 for explanation) are spread over different organizational bodies, both inside the emergency room and outside, thence making communication and a shared understanding difficult in pursuing the common goals. Figure 8 by White (2008) shows that process models are used to describe, analyze and alter business operations. Process models can help steer communication within the organization thereby i.a. supporting business operations, creating a framework for business metrics and referencing costs (White, 2008). Because we have identified the high complexity of the EDC environment, to identify and explicate the current and future business operations process modeling is used.

How

Business Process Modeling Notation is a language used to analyze business processes. BPMN is a standardized language and has evolved into a widely used language for modeling business processes. The reason is that it is has low complexity for modeling (White, 2004) through being a highly visual modeling method (Zur Muehlen & Recker, 2008). This modeling notation is fit for purpose in our study because we want to improve the understanding of the processes that are being carried out. Subsequently the differences within the new system can be visually represented and explicated.

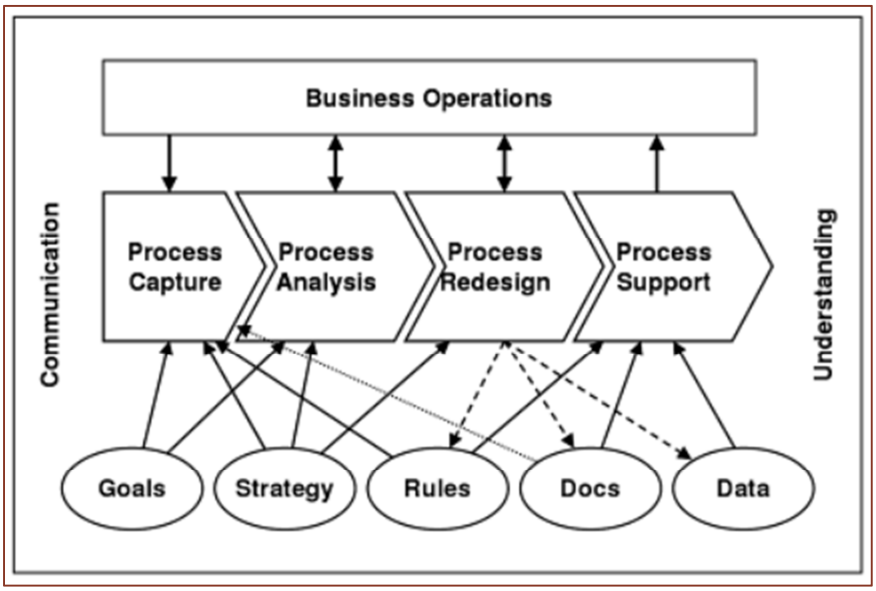

FIGURE 32 PROCESS MODELING THROUGHOUT ALL PHASES OF ORGANIZATIONAL CHANGE

From White (2004) the following description of the core elements of BPMN are explained. There are four core elements as depicted. These four elements (flow objects, connecting objects, swimlanes and artifacts) are used to describe the technical system of the EDC in the IST and SOLL states. An overview of the notation is given in figure 33. This is also used as reference to the description of the model and its terms as described below and the model depicted in figure 36 ("BPMN 2.0 - Business Process Model and Notation," 2011).

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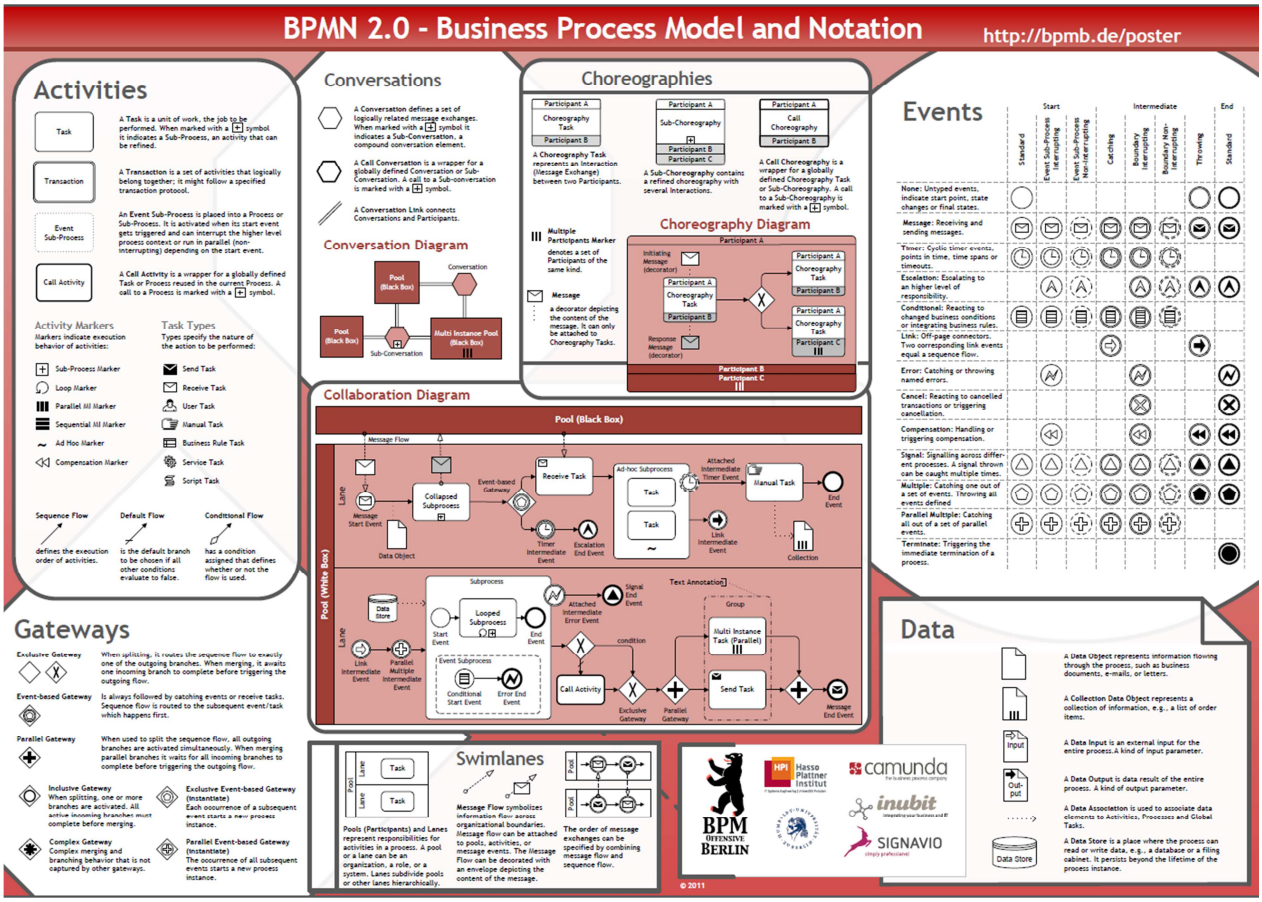


FIGURE 33 BPMN OVERVIEW OF MODELLING NOTATION

Explanation BPMN IST model

The process of handling an emergency call at the EDC consists of several steps, actors and systems that interact with each other. The model is built up through an iterative approach using available literature and shadowing at the Rotterdam-Rijnmond EDC and validated by interviewing experts / users. This has resulted in a BPMN model, based on the gained insights. The level of abstraction is and the inclusion or exclusion of processes or data blocks are based on the level of abstraction used in the study and relevance for it. Representation on a higher or lower level would increase or decrease complexity hence making the model less fit for purpose (according to scope). Furthermore activity blocks purposely involve redundancy (intake police, ambulance dept., fire dept.) for better visual representation of the EDC.

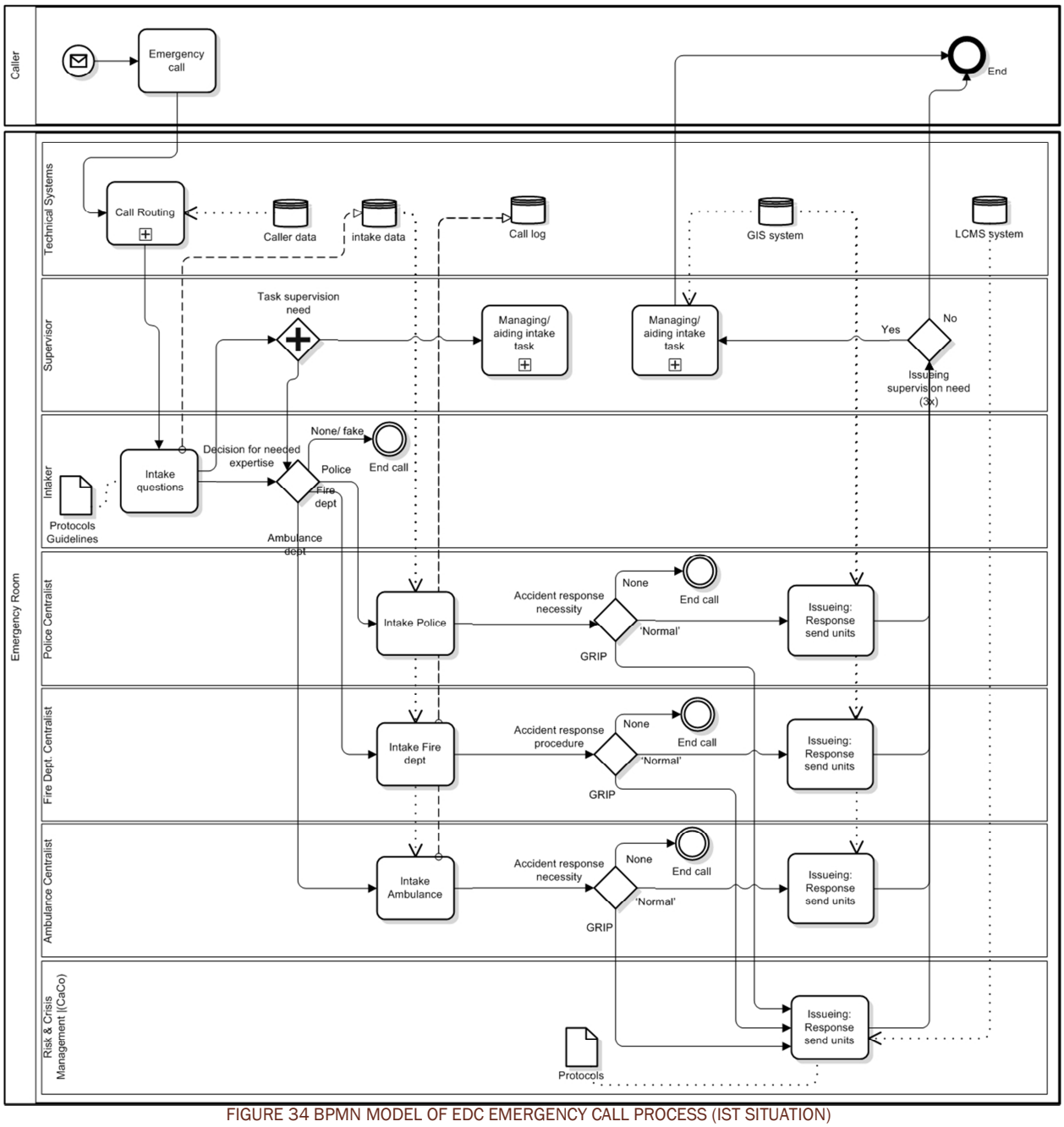


FIGURE 34 BPMN MODEL OF EDC EMERGENCY CALL PROCESS (IST SITUATION)

BPM process model of current situation

In this part a step by step description is given of the contents of the model depicted in figure 34. First of all the boundaries of the business process model are represented by two entities, or participants, which are the caller, initiating and ending the emergency call process and the Emergency Dispatch Center (says emergency room in picture change into EDC) handling this emergency call and consisting of six entities. The pools and lanes represent responsibilities for different tasks. Thus these are not necessarily different entities (people), but can be different roles as well as will be explained later. The process is initiated by an emergency call. This call can be a mobile call or a landline and can be a civilian or a professional call (e.g. police officer). The

processes are similar and here it is looked at only the civilian caller. A call is routed differently for a mobile or landline (see figure 35). Mobile calls are processed centrally in Driebergen. The "call processing Driebergen" can be further broken down and consists of an intaker that is responsible for asking two questions only; who and where, to determine to which EDC the caller should be forwarded. After an availability check the call is forwarded to the emergency dispatch center located nearest to and in the safety region from which the call is made. This all happens in a matter of seconds (interview e de wit). The reason for this centralization in case of a mobile call is that 80% of the five million calls coming in a year are abusive or accidental. This means that if these would be sent directly, the EDC needs extra people to determine abusive calls and separate them from real emergency calls. With Driebergen in between the EDC is certain that the mobile emergency calls are "real" calls which decrease abuse.

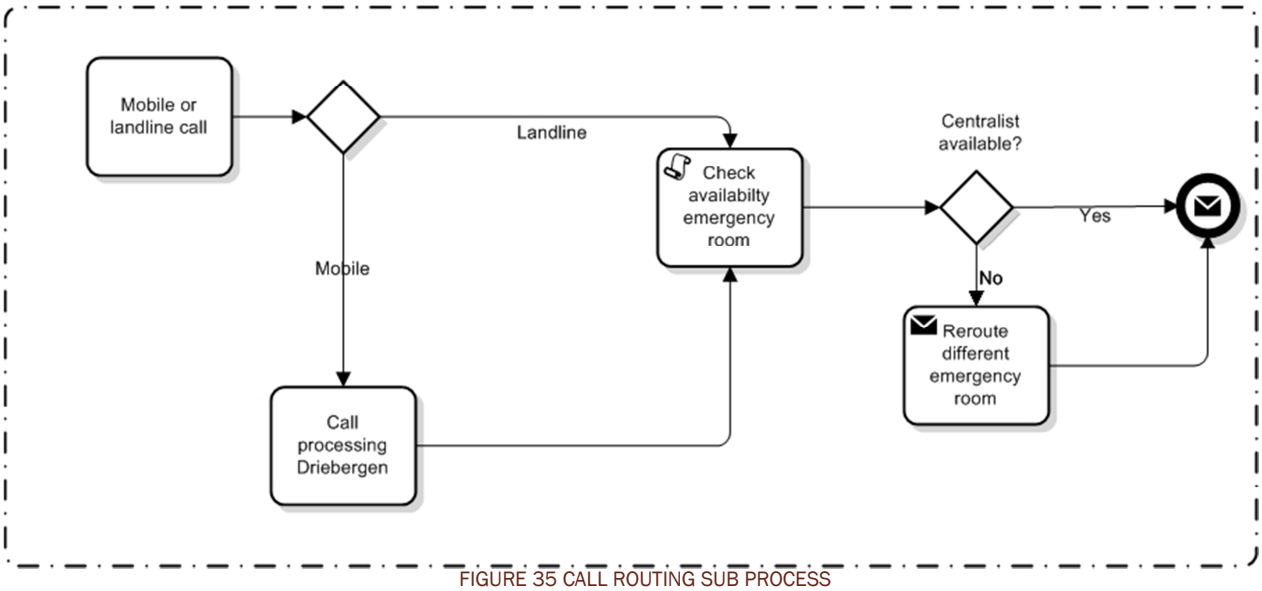


FIGURE 35 CALL ROUTING SUB PROCESS

Within the EDC different entities are identified important for the (operational) emergency call process. These are now explained by describing the tasks that are performed

- *Supervisor*

Supervision is used to oversee the whole of tasks within the EDC. This means that the supervisor amongst other things keeps track of personnel occupation. For instance when there are a lot of calls, the supervisor can assist intakers. Also during issuing the supervisor is busy monitoring units on the street and has an overview of the occupation of units in different areas. When units are needed in a certain area and therefore lacking in another area the supervisor can direct units to ensure that there are enough units available at any time. The supervisor uses the Geographical Information System with which the units are visible on a map.

- *Intaker*

Takes the call and sets up the initial report. Next to this the intaker performs other (administrative) tasks, unrelated to the emergency call process. The intaker asks for the type of emergency and what kind of help is needed (police, ambulance, fire dept.). The call is then forwarded to the centralist of the requested specialty. The first data is stored and is shown immediately on the centralist screen so that he/she can continue to ask follow-up questions upon the basic information the intaker has received.

- *Centralist*

The centralist is responsible for further questioning and for issuing units and monitoring units on the street. There are three different centralist roles in the EDC which are the Police centralist, responsible hen police is needed, Fire dept. centralist responsible for issuing calls when fire dept. is needed and Ambulance care dept. centralist responsible when medical assistance is needed. Selection criteria centralist

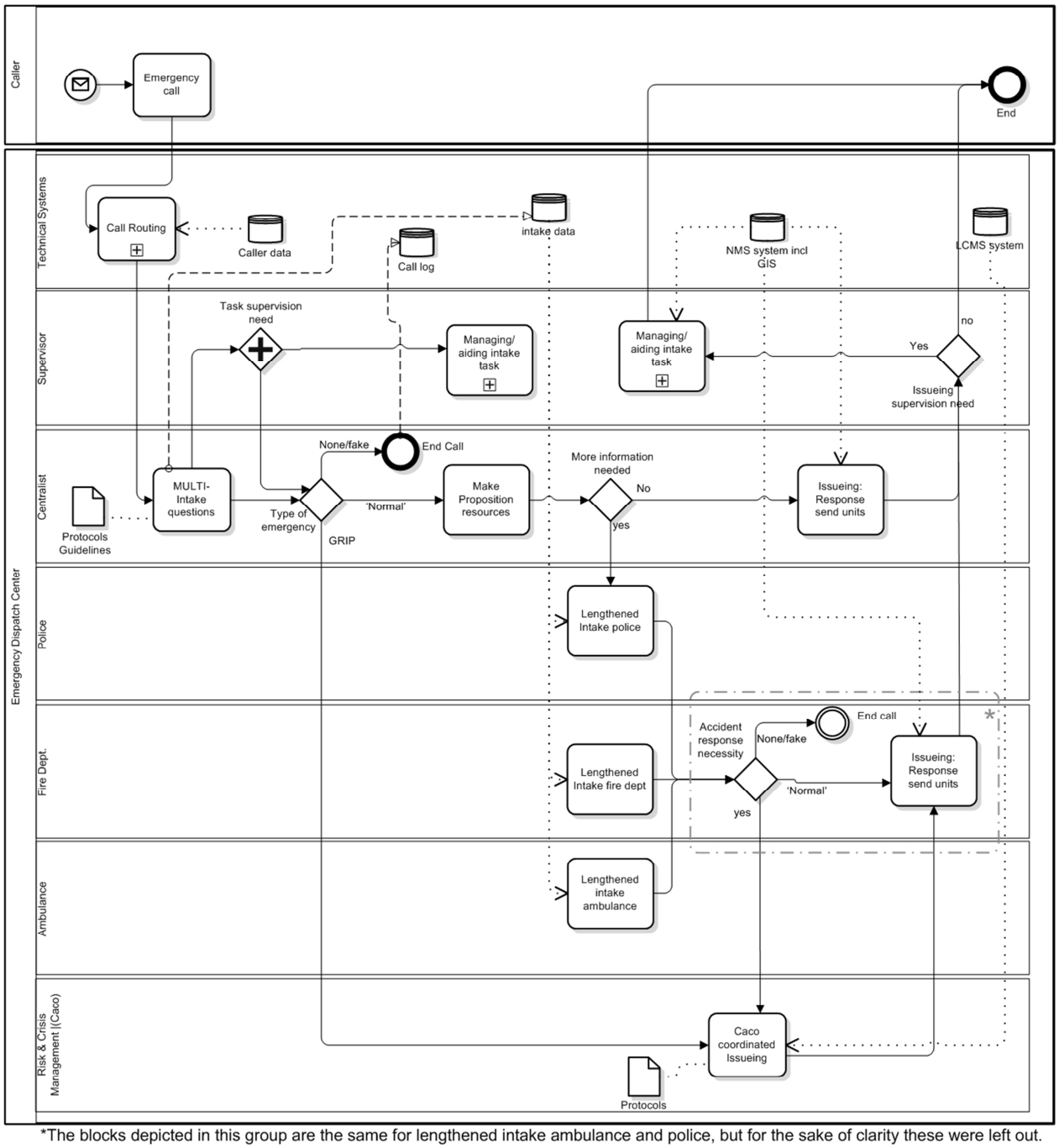
- *CaCo*

For GRIP situations (e.g. air plane crash, flooding, terrorist attack) there are a lot of protocols to *scale up* (increase forces, readiness and cooperation effort to decrease consequence of the accident) the organizational and operational forces. The *Calamity Coordination office(r)* (CaCo or OvD) leader of the incident command consultation (COPI) or regional operational leader are qualified to scale up to GRIP 1 or GRIP 2. In case of predetermined triggers for GRIP 3 or GRIP 4 this is also the case, but the mayor and/or president of safety region become part of the decision making process (De Jong & Thissen, 2012). As this beyond our scope, it will not be handled in more detail. Most important to note is that responsibility shifts in case of a GRIP situation.

- *Technical system*

Different systems are used to improve the speed, quality and accuracy of the processes within the EDC. Systems are used for logging calls, saving and disseminating caller information throughout the EDC, classifying emergencies according to protocols which in turn automatically trigger actions. Etc.

Model of desired business processes and tasks at the EDC (SOLL)



*The blocks depicted in this group are the same for lengthened intake ambulance and police, but for the sake of clarity these were left out.

FIGURE 36 BPMN MODEL OF EDC EMERGENCY CALL PROCESS (SOLL SITUATION)

A.7 OPERATIONAL CHANGES AND IMPACT

One of the biggest impacts of the new situation is that of the changing intake task/process structure (fig 37 and fig 38). The intake role and process are described before. Also the centralist multi-intake role is already described. We now first describe the change and then impact of the change. After this three scenarios are set-up.

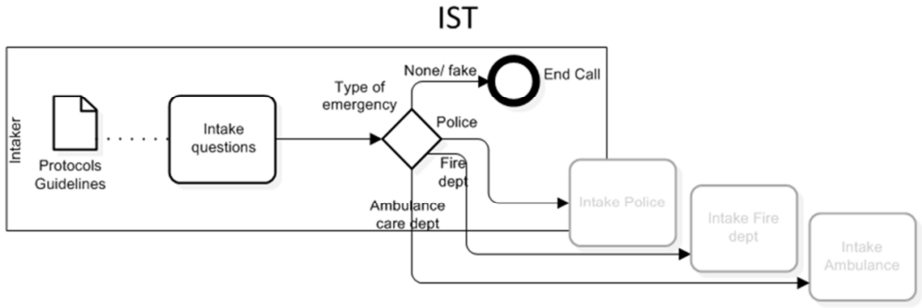


FIGURE 37 IST TASKS INTAKER

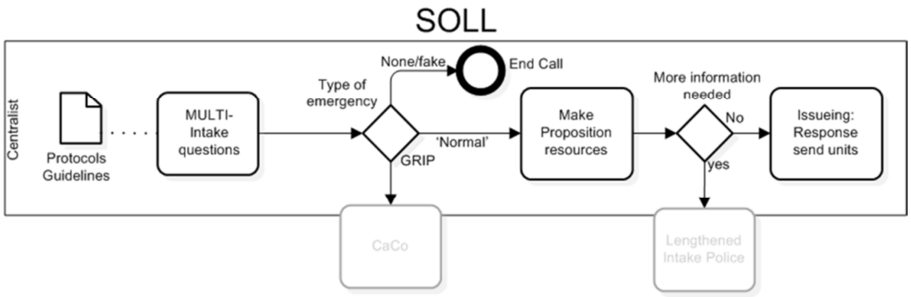


FIGURE 38 SOLL TASKS CENTRALIST

Point wise notation of changes and impact

The changes and impact are noted as follows.

- Situational change
  - Complication

- Intaker is removed from intake task
  - Intaker also does a lot of derivative tasks, so these have to be picked up by another entity
  - Intaker is a cheap working force (Scale 5 in governmental Functional Appreciation System (FUWASYS))
  - Intaker job is not highly skilled
    - Though requires personalized skills (communicative / stress resistant)
  - Intaker job has to be replaced in new system
  - Intaker was trained on the job → new multi-intake centralist also needs a form of training

- Centralist job will be multidisciplinary intake
    - New tasks / general task division
    - Higher skilled people needed for multi-disciplinary questioning (higher education in general)
        - Highly skilled people are more expensive
            - Centralist is scale 7 on the FUWASYS scale
            - New centralist will be even higher scale (so, employee costs go up)
    - Training needed (on the job versus, pre-selection processes)
    - Extra backup needed in case of extra information need
    - Less centralists needed in case of full implementation
        - Less costs (needed because of budget cuts of 25%, see appendix A8
    - Fully integrated multidisciplinary intake is difficult because of diversified skills needed

. Interviewees that validated this are depicted in Appendix A.10

A.8 FINANCIAL OVERVIEW

From the transition report the financial budgeting overview is depicted in table. This gives an idea of the EDC's challenge concerning financial room in the coming years (Ministry of Safety and Justice, 2013).

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022
Structural Budget Cut*	0	10	10	20	20	30	30	50	50
Total Budget*	200	190	190	180	180	170	170	150	150
Budget per EDC*	20	19	19	18	18	17	17	15	**15**
*** x1.000.000 €**									

TABLE 5 BUDGETTING CUTS OVER THE COMING YEARS FOR EDC'S

The starting budget is defined at 200.000.000 euro/year. From 2015 onwards the structural cuts begin to affect EDC's which need to increase efficiency or reduce costs to comply with the budget cuts. From 2021 onwards the EDC's will have 25% less to spend. The total will be 150.000.000 euro/year.

These figures do not include the transition costs that are being estimated on 90.000.000 euro in total. Also budgeting for C2000, NMS and 1-1-2 are excluded from these cuts.

A.9 ACTOR ANALYSIS

Actor analysis method

The actor environment of the problem owner is analyzed to get an overview of the situation, possible bottlenecks for designing solutions and to identify opportunities for this. The analysis is based on (Enserink et al., 2010). According to Enserink et el. the analysis chronologically of; formulation of the problem, inventory of actors involved, a formal chart including relations of actors and legislation, mapping of actor interests, objectives, resources and interdependencies and finally concluding upon the consequences this has for possible solutions. I mainly use it to inventorize and group actors. From an early analysis it is not important for the research to do a detailed actor interest analysis. In the following sections the steps are described and further details are given.

Problem formulation

For the actor environment, the project organization is interested in describing possibilities for improved information sharing among actors. First of all they have to be identified in order for this to be realized. The full problem formulation to this report is described in

Actors involved

To identify actors a positional approach is used. By reviewing existing structures formal roles are identified to find a first indication on which are the actors involved. Secondly a reputational approach is used. By open and semi-structured interviews with the problem owner and other relevant actors within the EDC environment an inventory of actors was drawn up of which a table is shown below. A general analysis of possibly important actors is done as to prevent precluding actors right away which might turn out to be relevant (Varvasovszky & Brugha, 2000). The organizational structure of the LMO (Appendix A4) is the basis. An extensive list of actors is given

Extensive list of actors

From the analysis the most important actors are distinguished. I decided that because of the scope of the research only some actors are described more detailed. In Table 6 the actor list is defined based on local and national authorities. Beneath it in table 7 a short description of relevant actors is given. The actors involved in emergency handling in general are taken into account in the first analysis, to give an overview of the playing field as it is and insight in the complexities in this changing organizational context. Actors are divided in groups to indicate levels of hierarchy and responsibilities. Beneath the table short explanations of actors tasks are given. After this initial mapping I eliminated and combined actors to get a relevant, understandable picture. This picture (figure 39) illustrates the formal relations between actors and shows which regulations are in place. From this list I have then identified which actors are important within the scope of my research. I asked the question 'which stakeholders have a direct

or semi-direct influence on the problem situation?' and 'from my scope, which influential stakeholders should be taken into account when designing solutions?' This resulted in the formal chart in figure 7, chapter 3.1.1.

Classification of national versus local governmental actors

National	Local
Ministry of Safety & Justice (VenJ)	Safety Region Rotterdam-Rijnmond
Ministry of Domestic Affairs (BZK)	Safety Region Zuid-Holland Zuid
Ministry of Public Health, Welfare and Sport (VWS)	Mayor of Rotterdam
Ministry of Defense	Mayor of Dordrecht
Safety Council	Regional police department organizations
National Emergency dispatch Organization (LMO)	Regional fire department organizations
Royal Military Policy (KMAR)	Regional ambulance care departments
National Police	Medical Assistance during Accidents and Disasters (GHOR)
Ambulance care organization	Risk & Crisis Management Rotterdam Rijnmond
Fire brigade	Regional Ambulance Provisioning (RAV)
Inspection Safety and Justice	Service Regional Operational Centre (DROC)
	Project organization merger control rooms RR-ZHZ

TABLE 6 CLASSIFICATION OF NATIONAL AND REGIONAL ACTORS

Actor descriptions

Actor	Responsiblility/description
Ministries of Safety and Justice (VenJ)	The minister can set demands to performance of departments and systems. This is done by an Order in Council (AMvB). Transition agreement is signed by the minister of VenJ and its responsibility is to establish and maintain the national emergency room organization (LMO) including ten control rooms(Ministry of Safety and Justice, 2013)
Ministry of Domestic Affairs (BZK)	Minister of BZK is next to the city an employer of a mayor. They become part of processes in case of disasters.
Ministry of Public Health, Welfare and Sport (VWS)	The minister of VenJ and VWS draft the main policies and control for the ambulance care with respect to the emergency dispatch center
Ministry of Defense	The minister of VenJ and Defense draft the main policies and control for the Royal Military Police (KMAR) with respect to the emergency control room.
Safety Council	Heads of safety regions. Strategic planning and agenda setting of safety regions
National Emergency dispatch Organization (LMO)	The LMO has the task to establish and maintain (max.) ten emergency control room locations in the Netherlands. This will be the new organizational body baring responsibility for the overall system
Royal Military Policy (KMAR)	The KMAR is situated under the ministry of Defense and partly under ministry of Justice and can be responsible for execution of tasks under emergency situations
National Police	Twenty five regional corpses, the corps National Police services (KLPD) and service collaborative Police Netherlands (vtsPN) form the National Police. They are one organization with ten regional units.
Ambulance care organization	Regionally organized but nationally regulated by protocols this organization is responsible for ambulance care in The Netherlands

Fire Brigade organization	Firefighting is and has been a municipal responsibility. This has been described in the law on safety regions (WVR) 2010.
Inspection Safety and Justice	The inspection of Safety and Justice is the inspection organ of the ministry of Safety and Justice. It's primary task is supervising organizations and control them on the execution according to set laws.
Safety Region Rotterdam-Rijnmond	The region of RR is defined as a safety region in terms of responsibility for safety related tasks. Emergency dispatch is (at the moment) regionally organized. In chapter 1 a short description is given of a safety region
Safety Region Zuid-Holland Zuid	The region of ZHZ is defined as a safety region in terms of responsibility for safety related tasks. Emergency dispatch is (at the moment) regionally organized. In chapter 1 a short description is given of a safety region
Mayor of safety region	Is the director of the safety region, with final responsibility for its operation. Usually this is the mayor of the largest city in that region
Regional Police, Fire and ambulance dept.	See figure 39. These parties fall under their respective national counterparts and regulations

TABLE 7 DESCRIPTIONS OF GOVERNMMENTAL ACTORS

Formal Relations chart

The figure beneath (figure 39) shows the formal relations between actors in the field of emergency management and emergency dispatching. In table 7 an explanation of responsibilities of each of these actors is given, so I will only explain the important relations here.

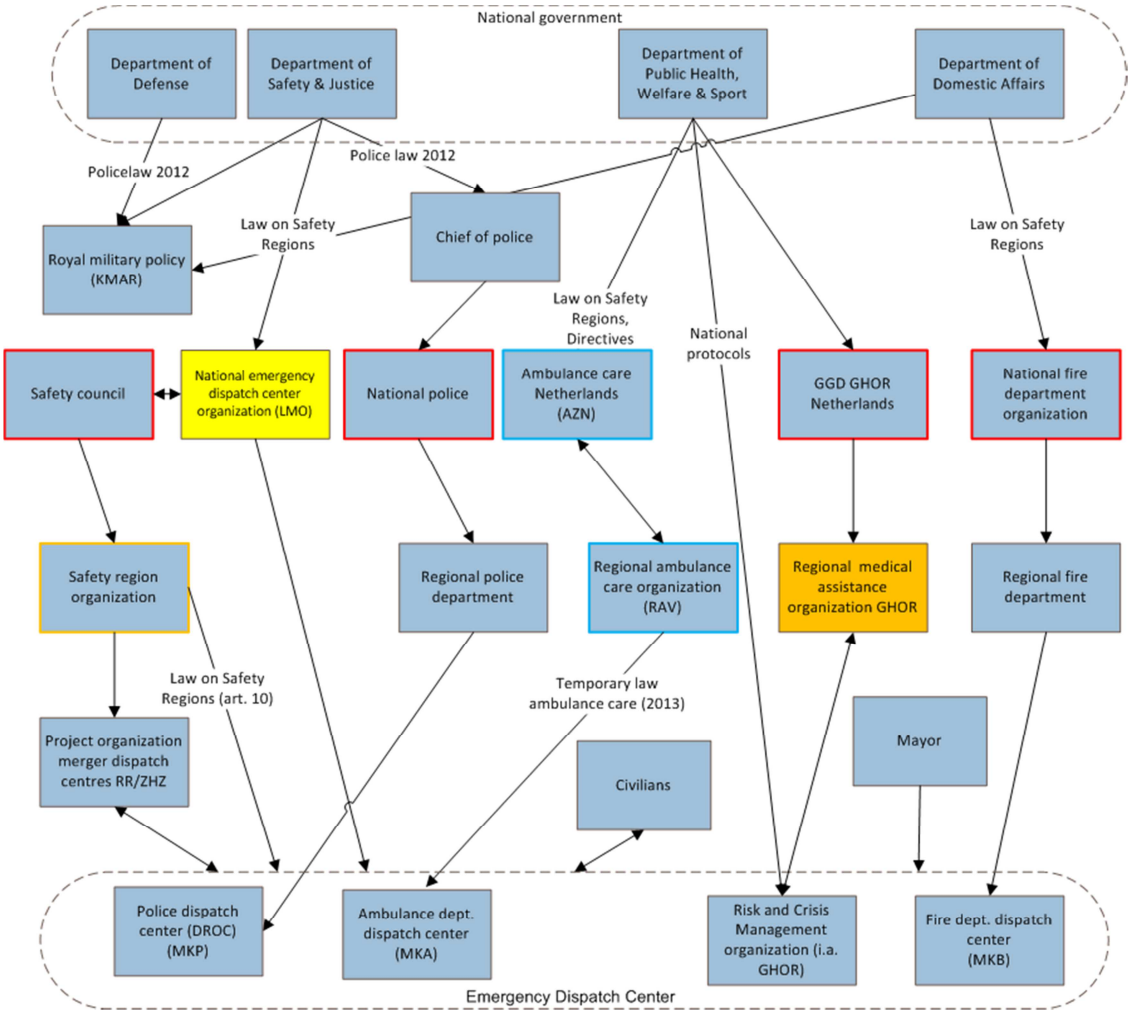


FIGURE 39 EXTENSIVE FORMAL CHART OF ACTORS

A.10 LIST OF INTERVIEWEES

1. E. De Wit – Police director Rotterdam-Rijnmond (interview 17-10-2014)
2. P. Den Hollander Police director Rotterdam-Rijnmond (interview 17-10-2014)
3. J. Hartman. Head of Project bureau at project organization (multiple interviews)
4. Anemieke Bakker – Crisis management organization VRZHZ (interview 14-09-2014)
5. Edith Langerak Department head IM at VRR (discussion meetings ,2014)
6. M. Meelis – Manager at VRR (discussion meetings, 2014)
7. Yvonne Huizing – Project leader work processes at project organization (multiple interviews)
8. B. Swet - Project leader work processes and quality at project organization multiple interviews)
9. Marjolein Rietveld – Intaker (evaluation survey and interview: 06-01-2015
10. Mieke Versnel – Intaker (evaluation survey and interview: 06-01-2015
11. Anoniem – Intaker (evaluation survey and interview: 06-01-2015
12. Suzanne Dusseljee – Centralist MKP (evaluation survey and interview: 06-01-2015
13. Manon Ram – Centralist MKP (evaluation survey and interview: 06-01-2015
14. Talitha Gouman - Centralist MKA (evaluation survey and interview: 06-01-2015
15. Marjolein Bos - Centralist MKA (evaluation survey and interview: 06-01-2015
16. A.P. Donker - Centralist MKA (evaluation survey and interview: 06-01-2015
17. John De Bres – Centralist MKB (evaluation survey and interview: 06-01-2015
18. Ardy Felius - Centralist MKB (evaluation survey and interview: 06-01-2015
19. Gert vd Nieuwendijk - Centralist MKB (evaluation survey and interview: 06-01-2015)
20. Gerard Lette – Supervisor MKP (evaluation survey and interview: 06-01-2015
21. Detmer Zandstra – Intaker/centralist MKP (evaluation survey and interview: 06-01-2015

Phase 1: Discussions

1. Edith Langerak, Micha Meelis, Sjoerd van Duijn, Jan Hartman, Yvonne Huizing (December: 2013)
2. Edith Langerak, Micha Meelis, Sjoerd van Duijn, Jan Hartman, Yvonne Huizing (Februari 2014)
3. Edith Langerak, Micha Meelis, Sjoerd van Duijn, Jan Hartman, Yvonne Huizing (March: 2013)

Phase 2: interviews

1. E. De Wit – Police director Rotterdam-Rijnmond (interview 12-17-2014)
2. P. Den Hollander Police director Rotterdam-Rijnmond (interview 11-17-2014)
3. J. Hartman. Head of Project bureau at project organization (multiple interviews)
4. Anemieke Bakker – Crisis management organization VRZHZ (interview 14-09-2014)
5. Yvonne Huizing – Project leader work processes at project organization (multiple interviews)

6. B. Swet - Project leader work processes and quality at project organization multiple interviews)

Phase 3: evaluation survey June 01 2015

1. Marjolein Rietveld – Intaker
2. Mieke Versnel – Intaker
3. Anoniem – Intaker
4. Suzanne Dusseljee
5. Manon Ram – Centralist MKP
6. Talitha Gouman - Centralist MKA
7. Marjolein Bos - Centralist MKA
8. A.P. Donker - Centralist MKA
9. John De Bres – Centralist MKB
10. Ardy Felius - Centralist MKB
11. Gert vd Nieuwendijk - Centralist MKB
12. Gerard Lette – Supervisor MKP

A.11 INTERVIEWING EXECUTION FORMAT

The survey consists of two parts. Part one is a questionnaire to be filled in by respondents and part two consists of the interviews with respondents as to identify the reasons behind their preferences/opinions. Open questions as to find out the reasoning behind the given answers. The questionnaire can be found in appendix A.12. There are seven questions per scenario in the questionnaire. Also the criteria are to be weighed per criteria in respect to the other criteria. Furthermore general questions are asked at the end of the questionnaire about the role of the employee. Only the relevant criteria that were found are questioned. The choice to incorporate only these seven most important criteria, and to choose the level of abstraction that I did, is because of time constraints for employees at the RR EDC and the research.

The interviews were conducted face to face and one-on-one. From the outset this was the best option to get the information I needed. It was not possible to create a group session during work time as the operators are constantly busy and it is unknown at what time calls will be coming in. Furthermore the occupancy within the EDC in general is on a minimal level to ensure low costs. Due to these constraints I thus had to perform the interviews and questionnaire within the RR EDC control room while employees where executing their work. This made it somewhat more difficult as calls had to be answered during the interviews. I performed the interviews over different work shifts in the EDC. Because the work is continuous there were no time constraints. I selected employees based on their role and on their availability. Some had already looked at the questionnaire that was sent but most hadn't. For this reason I chose to first explain my research, objectives and the questionnaire in detail and make sure they understood the questions and how to answer them. Then I would let them fill in the questionnaire and come back to discuss the results. This way they could take time to fill in the questionnaire when they had time. Then I came back to ask them about the reasoning behind their choices.

A.12 EVALUATION INTERVIEW QUESTIONNAIRE

Survey meldkamer Rotterdam-Rijnmond

In het kader van afstudeeropdracht

Geachte heer/mevrouw,

Allereerst hartelijk dank voor uw deelname aan mijn onderzoek. Mijn naam is Sjoerd van Duijn. Ik studeer Technische Bestuurskunde aan de TU Delft. In het kader van mijn afstudeeronderzoek bekijk ik welke afwegingen een rol spelen bij de taakverdeling en taakuitvoering op de meldkamer.

In het licht van de veranderingen op de meldkamer ben ik erg benieuwd naar de invloed van mogelijke veranderingen op diverse aspecten van uw werk. Er zijn diverse voorgenomen veranderingen op operationeel niveau voorgesteld die betrekking hebben op de taak en rolverdeling op de werkvloer van de meldkamer. Ik doel dan vooral op de voorgenomen multi-intake.

In het kader van mijn onderzoek wil ik u een aantal vragen voorleggen met betrekking tot drie scenario's. Eén van deze scenario's is de voorgestelde multi-intake, een ander is de huidige situatie en hiernaast heb ik nog een ander mogelijk scenario geschetst. U zou mij heel erg helpen als u onderstaande vragenlijst in zou vullen. Naast mijn interesse in uw antwoord op deze vragen ben ik geïnteresseerd in de redenen daarachter. Daarvoor neem ik graag binnenkort een kort persoonlijk interview met u af.

De uitkomsten van het interview en de resultaten van deze vragenlijst zullen anoniem worden behandeld.

Om een goed en volledig beeld te krijgen wil ik de verschillende rollen binnen de meldkamer interviewen. Ik ga daarom graag in gesprek met;

- Intakers
- Centralisten Politie
- Centralisten Brandweer
- Centralisten Ambulance
- Supervisors

Op pagina 2 vindt u de uitleg van de scenario's en de evaluatiecriteria die ik u vraag te beoordelen. Vanaf pagina 3 vindt u de vragenlijst. Ik dank u alvast hartelijk voor uw tijd.

Uitleg scenario's en criteria

Scenario's

De scenario's die zijn opgesteld bevatten een verschil in de rolverdeling en verantwoordelijkheidsverdeling voor medewerkers binnen de meldkamer. Ik ben geïnteresseerd in uw mening m.b.t. de vragen en ook waarom u dat vind. Daarvoor ga ik graag binnenkort met u in gesprek.

De volgende drie scenario's wil ik graag evalueren:

1) De verantwoordelijkheid en coördinatie voor noodoproepen ligt bij de "backoffice", bij gespecialiseerde centralist van de betreffende kolom (huidige situatie).
2) De verantwoordelijkheid en coördinatie voor noodoproepen ligt bij multi-intake centralist, waarbij indien nodig sprake is van verlengde intake door een gespecialiseerde kolomcentralist.
3) De volledige verantwoordelijkheid en coördinatie noodoproep ligt bij multi-intake centralist, waarbij er geen "back-up" is via verlengde intake.

Bovenstaande drie scenario's worden geëvalueerd met behulp van onderstaande 7 evaluatiecriteria. Ik wil u vragen deze goed te lezen. Op de volgende pagina vraag ik u uw scores te geven per scenario, met betrekking tot ieder criterium.

	Criterium	korte beschrijving van het evaluatiecriterium
1	One-stop-shop	Dit criterium is bedoeld om te bepalen welk scenario de beste "one-stop-shop" vertegenwoordigt. Een one-stop shop houdt in dat de klant in het eerste contact geholpen kan worden. (Hoe meer one-stop-shop hoe duidelijker de verantwoordelijkheid en "beter de coördinatie tussen de kolommen bekend is).
2	Uniformiteit	Hiermee wordt bedoeld in hoeverre het mogelijk is om een uniforme dienst aan te bieden onafhankelijk van het soort noodoproep.
3	Kwaliteit van dienstverlening	Hiermee wordt bedoeld de beschikbaarheid en bereikbaarheid van de dienst voor burgers, alsmede de tijd benodigd voor beantwoording van een oproep en de mate waarin een juiste analyse wor
4	Kosten	Dit criterium bestaat uit de de operationele kosten, vaak als resultaat van veranderende rollen /toegevoegde taken
5	benodigde expertise (kennis) en competenties	Hiermee wordt bedoeld de impact van de verschillende scenario's op benodigde expertise en competenties binnen de meldkamer
6	Support van Informatie systemen	De mate waarin het scenario wordt ondersteund door de (huidige) applicaties

7	Regelgeving	Dit criterium is erop gericht te evalueren of het geselecteerde scenario invloed heeft op de regelgeving, of vice versa (in hoeverre worden regels ondersteund).

Vragenlijst

Hieronder vindt u 3 tabellen met iedere keer 7 vragen. De vragen slaan iedere keer op de hierboven genoemde evaluatiecriteria. Iedere tabel representeert een scenario. Vul per rij in, in hoeverre dit volgens u een positieve of negatieve invloed op het evaluatiecriteria heeft. Dit doet u door middel van het aankruisen van een van de vakjes per vraag. Ik wil u vragen niet te schromen de antwoorden "extreem" in te vullen dus als u het ergens mee eens bent vul dan alstublieft een 5 in, bent u het oneens vul dan een 1 in. Scenario 1 is de huidige situatie, ik wil u vragen omdat dit geen veranderingen betreft, of u vanuit een 'blanco' gedachte in wil vullen hoe u dit scenario schat ten opzichte van de andere scenario's.

Mochten er toch nog onduidelijkheden zijn dan leg ik u graag tijdens ons persoonlijke interview een en ander verder uit.

De 5-punts invulschaal (1-5) representeert:

1. Zeer negatieve invloed op criterium
2. Negatieve invloed op criterium
3. Neutraal op criterium
4. Positieve invloed op criterium
5. Zeer positieve invloed op criterium

Scenario 1; De verantwoordelijkheid en coördinatie voor noodoproepen ligt bij de "backoffice", bij gespecialiseerde centralist van de betreffende kolom (huidige situatie).

SCENARIO 1	zeer negatief	negatief	neutraal	positief	zeer positief
	1	2	3	4	5
1 Invloed op one -stop shop	○	○	○	○	○
2 Invloed op Uniformiteit	○	○	○	○	○
3 Invloed op kwaliteit van dienstverlening	○	○	○	○	○
4 Invloed op kosten	○	○	○	○	○
5 Impact op benodigde expertise (kennis) en competenties	○	○	○	○	○

6 Impact op informatie systemen	○	○	○	○	○
7 Ondersteuning door regelgeving	○	○	○	○	○

Scenario 2; Verantwoordelijkheid en coördinatie noodoproep bij multi-intake centralist, waarbij nodig sprake is van verlengde intake door een gespecialiseerde kolomcentralist.

SCENARIO 2	zeer negatief	negatief	neutraal	positief	zeer positief
	1	2	3	4	5
1 Invloed op one -stop shop	○	○	○	○	○
2 Invloed op Uniformiteit	○	○	○	○	○
3 Invloed op kwaliteit van dienstverlening	○	○	○	○	○
4 Invloed op kosten	○	○	○	○	○
5 Impact op benodigde expertise (kennis) en competenties	○	○	○	○	○
6 Impact op informatie systemen	○	○	○	○	○
7 Ondersteuning door regelgeving	○	○	○	○	○

Scenario 3;Volledige verantwoordelijkheid en coördinatie noodoproep bij multi-intake centralist, waarbij er geen "back-up" via verlengde intake.

SCENARIO 3	zeer negatief	negatief	neutraal	positief	zeer positief
	1	2	3	4	5
1 Invloed op one -stop shop	○	○	○	○	○
2 Invloed op Uniformiteit	○	○	○	○	○
3 Invloed op kwaliteit van dienstverlening	○	○	○	○	○
4 Invloed op kosten	○	○	○	○	○

5	Impact op benodigde expertise (kennis) en competenties	○	○	○	○	○
6	Impact op informatie systemen	○	○	○	○	○
7	Ondersteuning door regelgeving	○	○	○	○	○

Tot slot wil ik u vragen in onderstaande tabel op de volgende pagina gewichten toe te kennen aan ieder van de 7 criteria. Hiermee geeft u aan hoe belangrijk u het ene criterium *ten opzichte van* de overige criteria vindt.

Weging van evaluatiecriteria t.o.v. elkaar

Weging evaluatiecriteria	zeer onbelangrijk	onbelangrijk	neutraal	belangrijk	zeer belangrijk
	1	2	3	4	5
1 One -stop shop	○	○	○	○	○
2 Uniformiteit	○	○	○	○	○
3 Kwaliteit van dienstverlening	○	○	○	○	○
4 Kosten	○	○	○	○	○
5 benodigde expertise (kennis) en competenties	○	○	○	○	○
6 Support van informatie systemen	○	○	○	○	○
7 Ondersteuning door regelgeving	○	○	○	○	○

Algemene vragen

- Wat is uw primaire rol/taak binnen de meldkamer (doorhalen wat niet van toepassing is): Intaker/ Centralist Politie / Centralist Brandweer /Centralist Ambulance / Supervisor
- Heeft u nog andere rollen bekleed binnen de meldkamer? Zo ja, welke?
- Eventuele opmerkingen

A.13 QUESTIONNAIRE QUANTITATIVE RESULTS

In this appendix the answers gained from the questionnaire are summarized. In table 8 the scores given by the respondents are put in. At the bottom the mean, mode and median scores are displayed. The columns for each scenario represent the different criteria that are questioned in the questionnaire (Appendix A.13). The abbreviations used are depicted in table 9.

ID	Type	Scores Scenario 1							Scores Scenario 2							Scores Scenario 3						
		OSS1	UNI1	QUA1	COS1	KNO1	ITS1	REG1	OSS2	UNI2	QUA2	COS2	KNO2	ITS2	REG2	OSS3	UNI3	QUA3	COS3	KNO3	ITS3	REG3
1	Intaker	3	1	2	3	3	3	3	2	4	4	3	2	2	2	5	5	4	1	2	1	1
2	Intaker	4	4	4	3	4	4	4	2	2	2	3	2	2	2	4	2	3	3	2	2	2
3	Intaker	5	3	5	4	3	3	3	2	3	2	3	2	2	2	1	2	1	2	2	3	2
4	CentralistMKP	4	4	4	5	4	4	4	2	4	4	2	4	2	2	5	5	2	2	2	3	2
5	CentralistMKP	2	2	4	4	4	4	4	4	4	4	2	3	3	2	4	4	2	2	2	3	2
6	CentralistMKA	3	3	5	3	5	4	4	4	2	2	3	3	3	2	4	1	1	4	1	3	1
7	CentralistMKA	4	5	2	3	4	4	2	2	2	1	3	1	4	4	5	5	5	1	1	4	4
8	CentralistMKA	4	4	4	3	5	4	3	4	3	4	1	3	3	4	5	5	5	5	5	5	1
9	CentralistMKB	4	4	4	5	3	3	2	2	2	5	2	5	3	4	2	3	2	2	4	3	3
10	CentralistMKB	4	3	5	3	5	5	3	3	4	2	3	3	2	3	2	4	1	3	1	3	3
11	CentralistMKB	5	4	4	3	5	4	4	2	3	2	3	2	3	1	1	2	2	2	2	3	1
12	SupervisorMKP	4	2	5	4	5	5	3	2	4	2	1	1	2	3	1	1	1	1	1	1	1
	Mean score	3,8	3,3	4,0	3,6	4,2	3,9	3,3	2,6	3,1	2,8	2,4	2,6	2,6	2,6	3,3	3,3	2,4	2,3	2,1	2,8	1,9
	Mode score	4	4	4	3	5	4	3	2	4	2	3	2	2	2	5	5	1	2	2	3	1
	Median score	4	3,5	4	3	4	4	3	2	3	2	3	2,5	2,5	2	4	3,5	2	2	2	3	2

TABLE 8 ANSWERS TO THE SURVEY

The answers given are quantized from 1-5 according to the answers given to the questionnaire displayed in appendix A.13. Answers are displayed per question and scenario in columns. At the bottom the mean (average) mode and median scores are displayed. I analyzed the mean, median and mode and decided to only use the mean scores. The usage of mode and median is not justified nor needed for the information I want to get out of the data. The usage depends on the purpose and statistical possibilities for analyzing the data.

OSS – One-Stop-Shop	KNO – needed knowledge / expertise
UNI – Uniformity	ITS – Information systems support
QUA – Quality of Service	REG – support by regulations
COS – Costs	wOSS – weight of criterium One-stop shop

TABLE 9 ABBREVIATIONS OF CRITERIA IN THE SURVEY

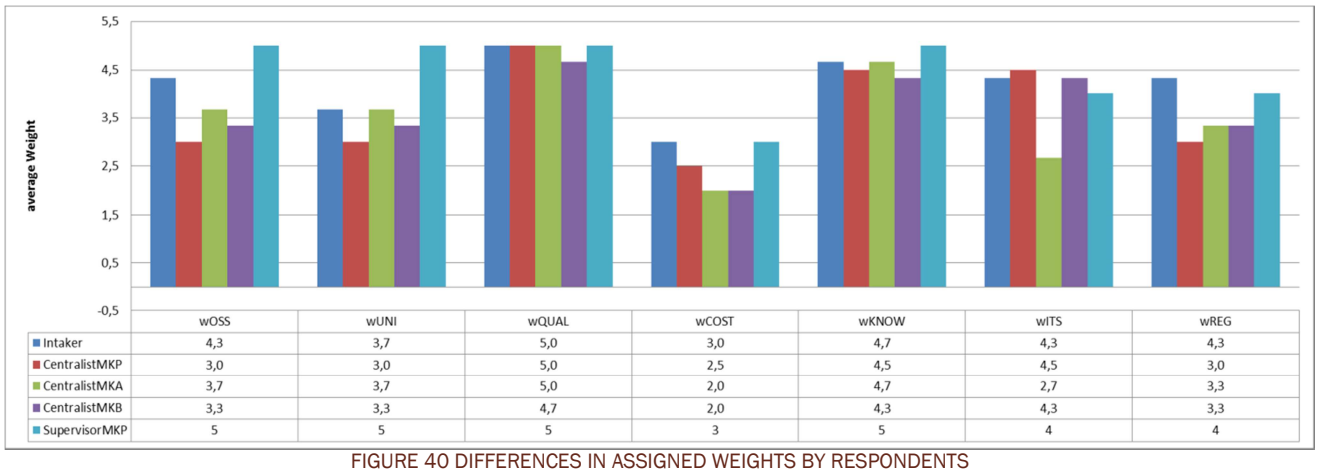
Table 10 shows the weights given by respondents to each of the criteria. Because of the weights differences can become more apparent are less obvious. Moreover differences between scenario 2 and scenario 3 seem less obvious then the difference with scenario 1. The weight assigned to each criterion is depicted in table 10. Quality of service is seen as the most important one next to the knowledge need. Costs are seen as least important from the viewpoint of operators. To get an idea of differences in assigned weights between operational roles figure 40 is depicted.

Observations from this column chart can be made concerning possible differences in opinion about what matters the most inside of the EDC.

ID	Type	Weights						
		wOSS	wUNI	wQUA	wCOS	wKNO	wITS	wREG
1	Intaker	4	4	5	3	5	4	4
2	Intaker	4	4	5	3	5	5	5
3	Intaker	5	3	5	3	4	4	4
4	CentralistMKP	2	4	5	1	4	4	4
5	CentralistMKP	4	2	5	4	5	5	2
6	CentralistMKA	3	3	5	2	5	3	4
7	CentralistMKA	3	4	5	3	4	1	2
8	CentralistMKA	5	4	5	1	5	4	4
9	CentralistMKB	4	5	4	1	3	4	5
10	CentralistMKB	2	2	5	3	5	5	2
11	CentralistMKB	4	3	5	2	5	4	3
12	SupervisorMKP	5	5	5	3	5	4	4
	average weight	3,8	3,6	4,9	2,4	4,6	3,9	3,6

TABLE 10 WEIGHTS ASSIGNED TO THE CRITERIA

In general looking at figure 40 it can be concluded that the scores assigned to the criterion in terms of importance are similar among operational roles. Two observations are worth mentioning from concerning existing differences. First of all police centralists are much more inclined to find uniformity and one-stop-shop important. Another notion is that KMA operators do not find information systems support that important, compared to other groups. This is although they score scenario 2 as very positive on this criterion, compared to the other groups (See chapter 6).



	wOSS	wUNI	wQUAL	wCOST	wKNOW	wITS	wREG
Intaker	4,3	3,7	5,0	3,0	4,7	4,3	4,3
CentralistMKP	3,0	3,0	5,0	2,5	4,5	4,5	3,0
CentralistMKA	3,7	3,7	5,0	2,0	4,7	2,7	3,3
CentralistMKB	3,3	3,3	4,7	2,0	4,3	4,3	3,3
SupervisorMKP	5	5	5	3	5	4	4

FIGURE 40 DIFFERENCES IN ASSIGNED WEIGHTS BY RESPONDENTS

A.14 EVALUATION INTERVIEWS QUALITATIVE RESULTS

In this appendix the extensive results of the qualitative part of the survey are depicted. The four operational groups and supervisor reasoning behind the scoring are discussed. Interpretations of the results are discussed in chapter 7. Per operational role the results of the interviews are summarized to reflect the reasoning behind the scores given. This is done per proposition for all of the operational roles and the supervisor role.

Intakers

The intakers think quality of service and one-stop shop are the most important propositions. While scenario 3 can compete with scenario 1 concerning the one-stop-shop proposition it can't for the other propositions. Apparently they really prefer the current situation more compared to the centralists.

P8. What is the influence on the criterium one-stop-shop

Callers are used to this situation so this is the best way.

P9. What is the influence on the criterium uniformity?

Disciplines are completely separated now. Uniformity in the new situation is also difficult because of geographical differences. Limburgers and Frysians may not understand each other through language barriers.

P10. What is the influence on the criterium quality of service?

There are at the moment too little people occupying the EDC. There are queues that occur because of this, which means callers have to wait. In scenario 2 and 3 more collaboration is possible, because in the multi-intake people can take over each other's tasks as now the knowledge is not available to take over tasks inter-organizationally. *We have a 'glass wall' between the organizations meaning a lack of collaboration.* In Multi-intake a shared (online) "notepad" can be used to exchange information. His is not allowed due to regulations (medical profession secrets for instance)

Through protocolling which you need in scenario 2 but definitely in scenario 3, the quality goes down as you can't use protocols if someone is panicking. You have to have personal contact to interpret the situation. Else it becomes a "machine" type response system. Everybody can follow a protocol, but it will have a bad effect on quality due to the above. For example a protocol cannot know when the next police car is or ambulance is ready. It will send a request to the nearest car when you hit "send", but maybe you know that another car will be available more quickly, so you decide to postpone the issuing. This is not doable when using protocols.

New situation with protocols could work, but it means more road units will be needed. With ProQA the amount of high priority drives has increased 40%. Just because of the protocol. In this sense the amount of people available is important. Specialism will be less in the new situation. You can lose your ability as you do not encounter as much of one specialism as you did before. For instance not so much fire dept. calls.

P10. What is the influence on the criterium costs?

Costs of education for scenario 2 are high and even higher in scenario 3 because of a lack of backup.

Commercialized ambulance care organization is a general problem. They care about costs before quality.

P11. What is the influence on the criteria needed expertise (knowledge) and competencies?

I do not think that I can do all three tasks. Through education this won't be possible for scenario 3 especially as no backup is available. Also I will lose my job. There will be a too large working area. No oversight. Learning the FMKB centralist trade might be pretty easy, however learning the MKA centralist job from my point of view requires years of education.

P12. What is the influence on the criterium support of information systems?

A lot of adaptations needed: In Multi-intake a shared (online) "notepad" can be used to exchange information. This also positively influences quality. However tough on regulations. ProQA protocols which are going to be more important in the new situation, aren't perfect according to intakers. A lot of non-useful information is requested from the caller.

P13. What is the influence on the criterium support for/by regulations?

Adaptations needed as well. Juridicially it is not manageable to go to the new situation. In terms of criminal and medical data there are tension between the agencies. A police centralist wants to know things from a criminal point of view, so would maybe want the medical info, which now is not given for privacy reasons.

You are being judged on the usage level of protocols MKA centralists have to follow the protocol for 96% else they get penalty points. This is ridiculous as it does not say anything about quality. Multi-intake (sc2 and sc3) can only work if it is judicially covered. Changes are then needed.

MKP centralists

In general the MKP centralists find both the current situation (scenario 1) as scenario two as similar. Especially concerning uniformity, quality and knowledge they are in general positive towards the new situation as desired (Scenario 2). Scenario three scores high on one-stop-shop but and uniformity but low on other criteria.

P1. What is the influence on the criterium one-stop-shop

Now the intaker only puts you through, then you will have more overlap between multi-intaker and the specialist. Another view within the MKP: *"helping everyone in one go is just better"* multi-intake is positive for this"

P2. What is the influence on the criterium uniformity?

Every centralist performs the same task and has the same view at the moment, which increases uniformity compared to a situation where different background people will do multi-intake.

Through better education uniformity can increase as well in multi-intake situations. In scenario 3 this is best.

P3. What is the influence on the criterium quality of service?
The quality of scenario 3 is less than scenario 1 because the service will become more superficial, as knowledge is not sufficient to handle in the same detail.

P4. What is the influence on the criterium costs?
To have the education of all three will increase costs for operators a lot, so multi-intake higher costs

P5. What is the influence on the criteria needed expertise (knowledge) and competencies?
Not manageable to know everything of the disciplines. Expertise on areas will go down. So this is not positive for expertise in general. Education itself is doable I think, however you have to be really sure that knowledge A lot of available tacit knowledge might disappear

P6. What is the influence on the criterium support of information systems?
From the MKP point of view it will become very unclear. Already we work with a lot of applications that are specific. My hardware and software is most important. I already deal with bad headphones. With the budget cuts I am not convinced it will become better.

P7. What is the influence on the criterium support for/by regulations?
If you do not adapt current regulations, you can't get to the new situation. "*If you are able to change regulations then I think the two new scenarios are viable"*. Rules should be are accounted for, which is not obvious. Changing of rules is needed to adapt to the knowledge level that is feasible.

MKA Centralists

In general MKA centralists were most positive of the current situation (scenario 1), naming reachability and quality as important inhibitors for the new situation to be established. Also very importantly they describe the fear of regulation changes, losing their BIG registration, and making their profession obsolete. Scenario 3 would be preferred over scenario 2 if it is feasible as scenario 2 is then just half a measure not increasing efficiency/uniformity. They see the one-stop-shop, uniformity and quality as very positive for scenario 3.

P1. What is the influence on the criterium one-stop-shop?
I do not think that a caller cares if it is one-stop or not. I think it is less, but I am also afraid of losing my job. Currently if there are errors you have to go back through the whole process and start over so then the new situation is better as a one-stop-shop.

P2. What is the influence on the criterium uniformity?
At the moment you always get the organization you need. I the new situation this might not be the case because it might be more difficult to judge however among MKA centralists it is also believed that uniformity is eventually better due to improved coordination. New situation uniformity increases thus also quality. *I think LMO and intake will become a factory and our jobs like assembly line work."*

P3. What is the influence on the criterium quality of service?
In general you still need specialists so lengthened intake. This means twice the work which is not good for quality nor one-stop-shop propositions. Backup is needed for very specific questions, so

scenario three is not manageable from my perspective. It leads to more usage of road units if someone is unsure he/she will always send units. A lot of queues are present because of mono-intake currently. Bad for quality and reachability it is deemed by one. Scenario three could be ideal for callers, however very expensive

P4. What is the influence on the criterium costs?

Costs are increased not within the EDC but in the EDC domain as road units will have to move out more often. SC2 and SC3 are expensive due to education and possibly more road units needed. Costs inside the EDC may go down on long term, but outside they go up.

P5. What is the influence on the criteria needed expertise (knowledge) and competencies?

It is too superficial as the consequence of too high knowledge demand impeding quality in the end. Knowledge is not the only requirement, soft skills, stress level, personality traits are at least as important. If education is not focused upon but instead protocols are good, then some of them think it is possible to go to multi-intake.

P6. What is the influence on the criterium support of information systems?

proQA system is not 'watertight' so if you use that in the new situation it has to be more used then I expect less quality. If you use protocols you can 'play it safe' however thing can fall between the cracks. (increasing costs due to more sending of units)

P7. What is the influence on the criterium support for/by regulations?

At the moment MKA centralists are BIG registered, which means that you have had the proper education and that your knowledge is up-to-date. If you do not use this knowledge then MKA centralists are afraid they lose their registration if they handle less ambulance emergency calls. Moreover if this would not be required anymore their education of about 4 years becomes obsolete for the job.

You can't expect someone to know all the rules of all professions they think. Keeping intake and issuing separate reduces errors. By using a lot of rules you can glue everything shut in terms of when to send units or not, but it decreases the quality, as professional opinions matter. *If I ask the protocolled proqa question; "Is he breathing", this can have only two answers; yes or no. The response on what to do can be different for different circumstances. Thus I need my professional experience to judge the situation indepth"*

MKB centralists

In general the MKB centralist is inclined to find scenario 1 a positive scenario concerning most propositions. They are fairly negative towards effects of criteria on the other scenarios. Most important considerations are described below.

P1. What is the influence on the criterium one-stop-shop

More errors in the new situation lead to longer calls and more need for backup, decreasing one-stop-shop compared to the current situation, however '*When a true multi intaker is present this is the best one-stop-shop in theory, but in practice it is not reachable so It's negative in practice in my view.'*

P2. What is the influence on the criterium uniformity?

In the current situation a call for fire dept. will always get the same (type) response so is always more uniform than when you have a multi-intake centralist with backup need. If a true multi-intaker is present this is the best uniform answer as they can handle calls the same way never mind the type.

P3. What is the influence on the criterium quality of service?

There is always a grey area of which units to send, how to respond. The quality here depends on how well the cooperation is. In the current situation it is very clear who does what, but if this is qualitatively the best is unknown. However the new situation is even more unknown. In the new situation less expertise leads to increased errors

P4. What is the influence on the criterium costs?

Costs are not important unless this means that MKB centralists are going to get fired.

P5. What is the influence on the criteria needed expertise (knowledge) and competencies?

In scenario three no backup is a great risk when someone needs help and the knowledge requirement becomes very (too) high. Currently due to specialism you can help each other out with complex issues. This can be resolved by protocols (e.g. USA model, which also works, where units are almost always sent to the scene), but this is dependent on resource scarcity on the road as well. Less specialist expertise overall will be available as holistic expertise is needed. "*The view of the operator is very important for how the situation is handled, in my case the fire dept. view."* Through asking some protocolled questions as a basis you can increase uniformity. More protocols = more uniformity.

P6. What is the influence on the criterium support of information systems?

The apparent effect on the systems for implementing scenario two or scenario 3 is not seen as a big deal. Only classification of emergencies might be a problem. A classification system is needed that can handle this. This is not available at the moment, so currently this inhibits collaboration among agencies. Protocolling decreases quality of service

P7. What is the influence on the criterium support for/by regulations?

In scenario 2 the current BIG registration required for MKA can become problematic. MKB centralists mostly have a firefighters diploma, however this is not a registered diploma and thus not needed. The BIG registration ís a registered diploma which you need to do MKA dispatching.

The institutional setup of MKB and MKP is different compared to the MKA environment. MKA has private organizations (health care providers) that lobby for cost cutting and efficiency increase. Because ambulance road units are private and get paid by these insurance companies they can have different interests. The y do not want to drive unnecessarily as they do not get paid for that. They might thus not be happy about a protocolled multi-intake.

Supervisor MKP

Only one supervisor was questioned, however some interesting views came to light here as well. It is important to take into account these expert's opinions as well to compare with the operators.

P3. What is the influence on the criterium quality of service?

The quality goes down when using protocols, For example in case of a woman in labor, a lot of questions from the protocol become unnecessary while time is of the essence. *"je kan wel protocolleren en dan geen kennis nodig, maar het is funest voor de kwaliteit."*

P4. What is the influence on the criteria needed expertise (knowledge) and competencies?

It depends on if and how much protocolling is used. The job of police centralist is learnable, also without a police background. So I do not see issues there in terms of education/training for multi-intake.

P5. What is the influence on the criterium support of information systems?

With proqa. 96% of the protocol needs to be scored by the MKA centralist. This system does not necessarily improve the quality (see quality)

P6. What is the influence on the criterium support for/by regulations?

Privacy laws concerning medical data inhibit the multi-intake. There is a tension between the disciplines to ask questions based on the view of the operator. A policeman wants to know more about the victim, which information a medical operator cannot supply due to regulations. That inhibits working together now, but if you want to go to multi-intake this has to be changed or it is not workable.

A.15 CAUSAL RELATIONS BETWEEN INDICATORS AND CRITERIA

Figure 41 the causal relationships in the environment. The most important relationships are presented. The picture explains how criteria are influenced. Only the causal effects are shown in this diagram. A lot of effects are not causal and they are explained in chapters 6&7

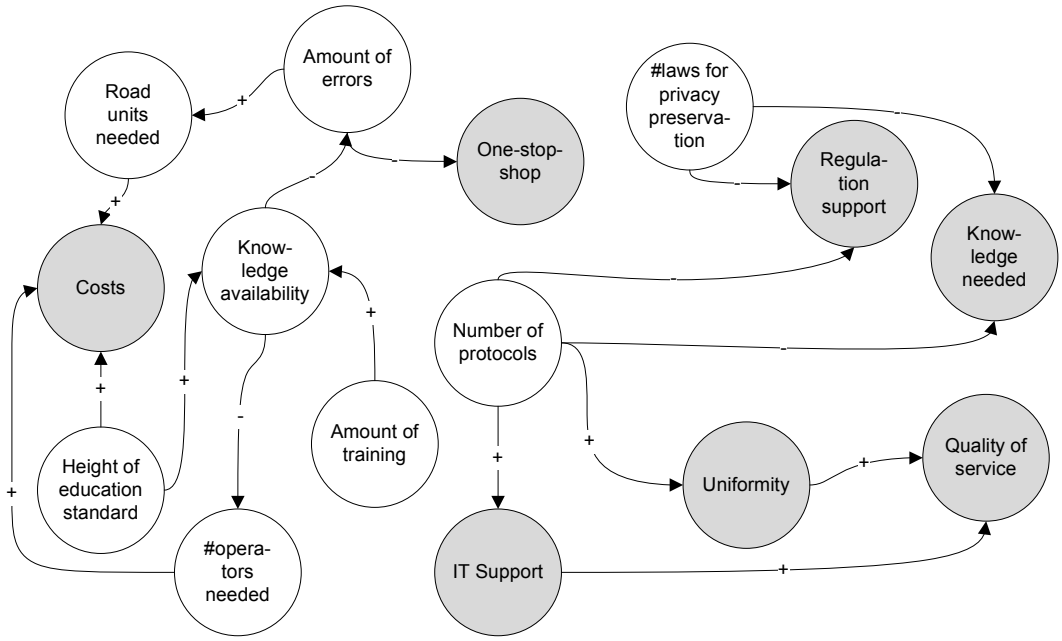


FIGURE 41 CAUSAL RELATIONSHIPS ACCORDING TO OPERATIONAL EMPLOYEES.